Commodore 64™ **PREMIER ISSUE** VIC-20™

COMPUTE!'s GAZETTE™

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July 1983
Issue 1 Vol. 1, No. 1
63380

For Owners And Users Of **Commodore VIC-20™** And **64™** Personal Computers

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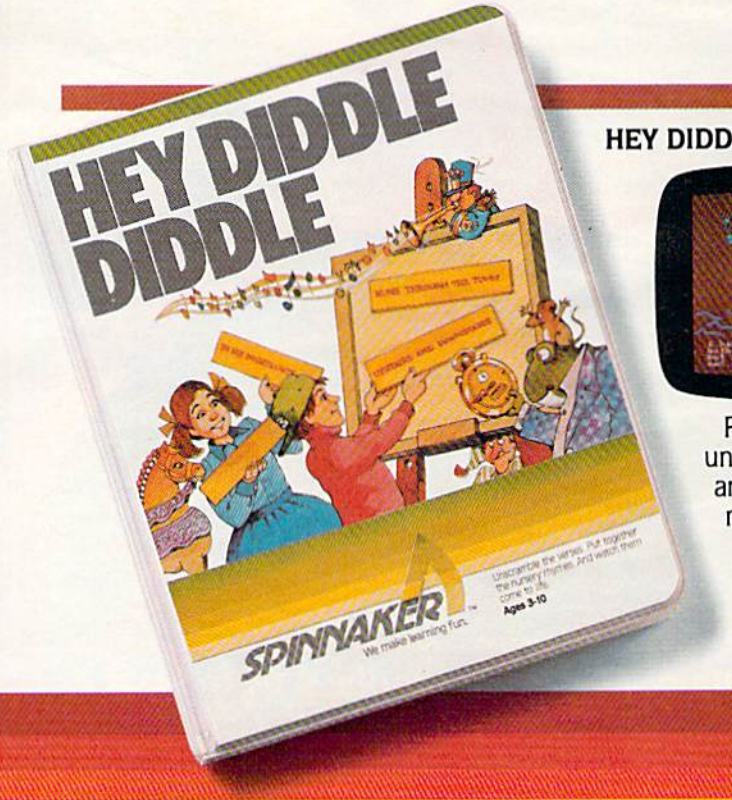
So if you're looking for computer programs that do more than just "babysit" for your kids, read on. You'll find that our Early Learning Programs are not only compatible with **Apple,® Atari,® IBM®** and **Commodore 64™** computers, but also with kids who like to have fun.



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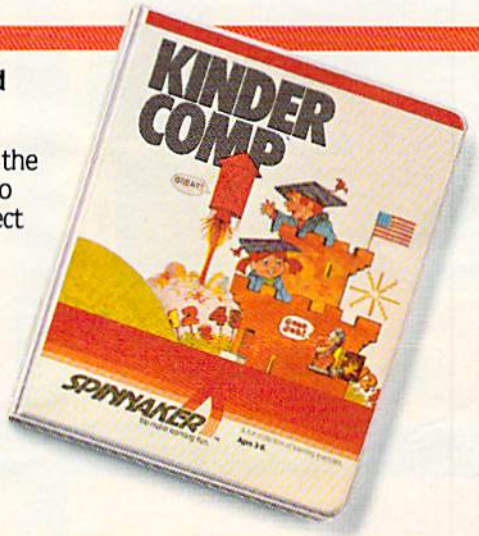

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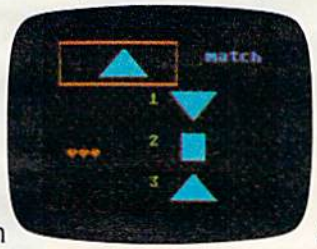

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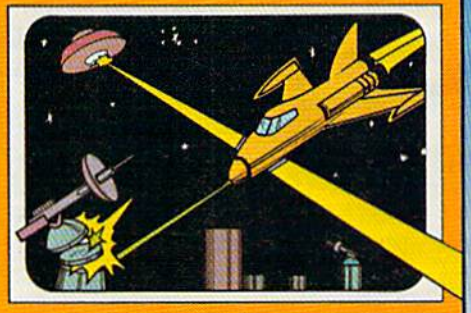

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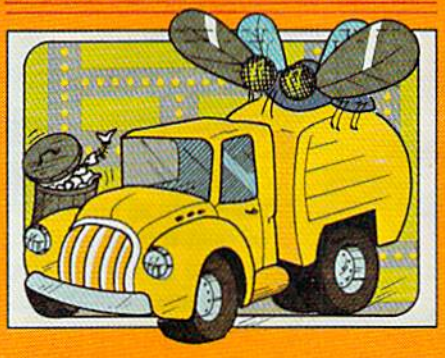

Joystick controller required.

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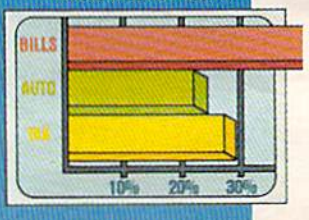

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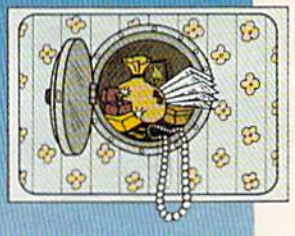

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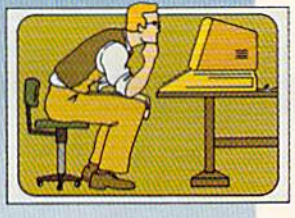

These Home Application Programs are also available for the VIC-20.

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THE EDITOR'S *notes*

Welcome to the premiere issue of *COMPUTE!'s Gazette* for Commodore VIC-20 and 64 personal computers. You are participating in one of the most successful launches of a personal computer magazine in the history of our industry. Press run for this initial issue is 175,000 copies (up from an originally planned 75,000).

Where is the demand coming from? Well, we estimate that Commodore is currently selling over 100,000 VIC-20s and 64s a month. Dozens of software and other support vendors are rushing to supply products for these rapidly growing markets. Personal computing power is now expanding at a rate far past that predicted by industry observers. With the recent price decreases in the VIC-20 and 64, we expect this trend to continue its dynamic escalation.

Why *COMPUTE!'s Gazette*? As publishers of **COMPUTE!** Magazine, we've been well aware of the need for clear explanations and support for beginning personal computer owners. **COMPUTE!** has done an excellent job of building and maintaining leadership in bridging the gap in information, applications, and support of a wide range of personal computer users. In looking at the marketplace, and in studying the feedback from our readers, we realized that our *Gazette* – positioned to support readers not yet ready for some of the more sophisticated features of **COMPUTE!** – was our missing link to the emerging consumer marketplace.

COMPUTE!'s Gazette will maintain the quality and editorial standards of **COMPUTE!**. It will be written to support a broader mix of beginning and intermediate computer users. In every issue, you'll find interesting tutorials, exciting games and applications, hints, and much more.

A Call For Articles

Now that we've briefly explained the goal and direction of *COMPUTE!'s Gazette*, we invite you to consider submitting an article or program. For more information, see the author's guide in this issue.

User Groups, Where Are You?

As a regular feature of the *Gazette*, we plan to publish the names and addresses of local user groups. Send in the following information, addressed to *Gazette User Groups:* Group Name, mailing address, contact person, and local telephone number (if desired). Please include a brief description of your group, including date founded, sponsoring company if any, frequency of meetings, number of members, and any other pertinent information you think useful (such as composition of group, etc.).

An Introduction To The Editors And Columnists Of *COMPUTE!'s Gazette*

Tom Halfhill, Editor, is a journalism graduate, with honors, from Kent State University. After several years of newspaper and regional magazine work, Tom initially joined **COMPUTE!** in the spring of 1982 as Features Editor of **COMPUTE!**.

Dan Carmichael, Assistant Editor, has a background in writing and programming support. He is quite knowledgeable about the VIC-20 and 64.

Richard Mansfield, Senior Editor of **COMPUTE!** Publications, is also the author of *Machine Language for Beginners*, a recently introduced **COMPUTE! Book**. He'll be writing, in his usual clear prose, a monthly column on the same topic.

Fred D'Ignazio is a prolific and frequently published author in the personal computer field. We're sure you'll appreciate Fred's ability to write clearly for both children and adults.

C. Regena (Cheryl) has been best known to **COMPUTE!** readers as a strong columnist for readers at all levels who use the TI personal computer. With this issue, she makes her debut using the same writing skills and programming expertise with the VIC-20.

Larry Isaacs is a BSEE who originally worked for **COMPUTE!** when **COMPUTE!** was starting up. Now a software specialist with Micro Technology Unlimited in Raleigh, NC, Larry is bringing to the *Gazette* his ability to clearly explain the sometimes unexplainable.

Enjoy the premiere issue of *COMPUTE!'s Gazette*, and please use the *Editor's Feedback* postcard in the back of the magazine to let us have your thoughts and input.

Robert Lock

Editor-In-Chief

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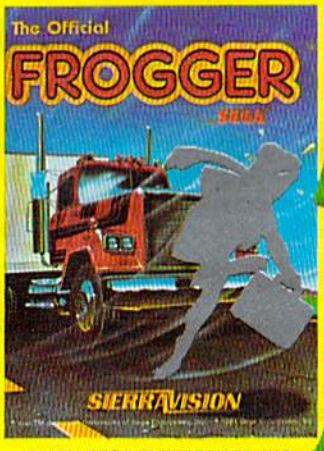

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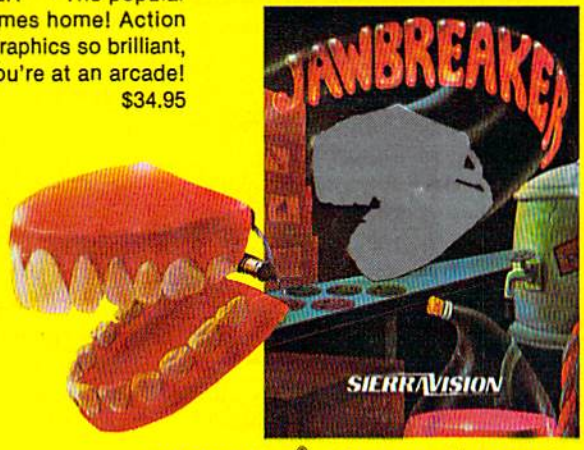

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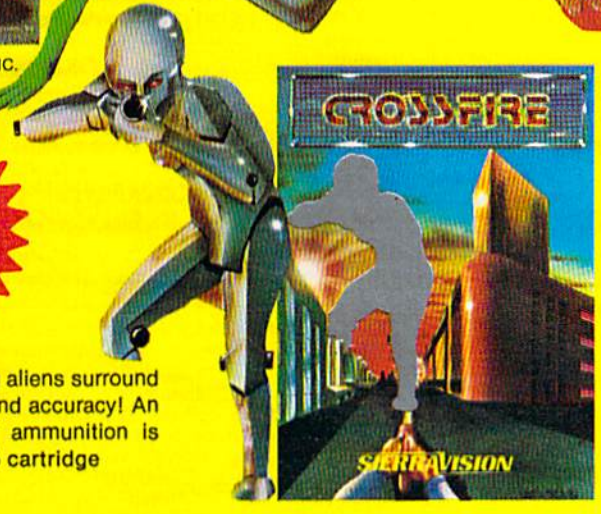

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GAZETTE FEEDBACK

EDITORS AND READERS

Do you have a question or a problem? Or have you discovered something that could help other VIC-20 and Commodore 64 users? Do you have a comment about something you've read in COMPUTE!'s Gazette *for Commodore? "Gazette Feedback" wants to hear from you. For our first issue, we've assembled some questions written to our companion magazine,* **COMPUTE!**.

Automatic RUN

I own a VIC-20 personal computer. I have yet to find an explanation of just how to get a BASIC program to run automatically after it has been loaded from tape. Can you help? Thanks.

Tim S. Hallen

As you know, when you type LOAD and press RETURN on either a VIC-20 or Commodore 64, the next program on the cassette tape is entered into the computer's memory. You must then type RUN and press RETURN to actually start the program. But there is a way to LOAD and RUN programs automatically.

Instead of typing LOAD, hold down the SHIFT key and press the RUN/STOP key. The next program on the tape will be LOADed and then RUN automatically. If the cassette has been rewound to its beginning, the program LOADed and RUN will be the first program on the tape.

Commodore 39?

I have been thinking about purchasing the Commodore 64 computer for home use and to play video games. But I'm a little skeptical of the 64K RAM advertised by Commodore. Does the Commodore 64 have 64K RAM that can be used in a program written by the owner? If the 64K RAM is available, how is it used? Since only 39K RAM is available for BASIC programs, is there a way to add a memory expansion cartridge to expand the BASIC RAM to 64K? Does such a cartridge exist or does Commodore or a second-party manufacturer plan to produce one?

Lt. Melvin S. Swain

We've received several letters on this question. It's true that the Commodore 64 has 64K (64000 bytes) of Random Access Memory (RAM). But it's also true that "only" about 39K (38911 bytes, to be exact) are available for BASIC language programming.

At the heart of all personal computers is a silicon chip called a microprocessor. *This "computer-on-a-chip" is what makes computers such as the Commodore 64 and VIC-20 possible. The 64's microprocessor is a chip called the 6510. It is a variation of the popular 6502 chip found in the VIC-20, Atari, Apple, and other small computers. One characteristic of this chip is that it can* address *(access) only 64K of memory at a time.*

If the designers of the Commodore 64 simply filled the computer with 64K of empty memory, the machine would be helpless. Computers need certain built-in programs to function and to make them easier to use. Don't confuse these built-in programs with the programs you write yourself or load into the computer from tapes or disks. The built-in programs are permanently stored in special memory chips called ROMs (Read Only Memories). Unlike other programs, they remain safe in their ROM memory chips even when power is turned off. The BASIC language itself is one of these programs. Another is the operating system, *which performs "housekeeping" duties that you're not usually aware of.*

These internal programs need some of the 64K of space that the 6510 microprocessor chip can address. To make room for them, the Commodore 64 designers used some of the RAM area. That's why, when programming in BASIC, you have only 39K of memory. The "missing" 15K RAM is taken up by the BASIC language, the operating system, and other things. This design is common in personal computers. What is less common is that the designers made it possible to temporarily "switch off" the Commodore 64's ROM, thus freeing the full 64K of RAM underneath.

Unfortunately, when you switch off BASIC and the operating system, you are left with an "unconscious" computer. It has no tasks to perform at all, knows nothing; it's pure memory with no thought patterns at all. You must replace the operating system with one of your own that takes care of the necessary housekeeping tasks. Since BASIC is gone, too, this replacement must be machine language. Therefore, the full 64K of RAM is directly available only to very advanced programmers. Average users will benefit from this feature indirectly. Eventually, there will be some commercial programs with their own custom operating systems to take advantage of the 64K.

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The fact that less than 64K is available to the average user is not peculiar to the Commodore 64. All computers have varying amounts of "overhead," memory which the computer consumes for its own purposes. For example, although the VIC-20 is advertised with 5K of RAM, only 3.5K (3583 bytes) are available for BASIC programming. This is true of other brands as well. The new 64K Atari 1200XL has about 38K for BASIC programming; so does a 48K Atari 400 or 800.

Since the Commodore 64 already contains all the memory it can address at once, there are no memory expansion cartridges from Commodore or other companies. But such a cartridge is feasible using a special technique called "bank selection." Extra memory in the cartridge would be "swapped" with existing memory in the computer. For instance, such expanders make it possible to put 96K in a Commodore SuperPET, 128K in an Apple IIe, or 160K in an Atari 800.

Adding VIC Memory

I own a VIC-20 computer and would like to add some memory. The problem is, where does one start with memory on the VIC – with 3K, 8K, 16K, or a combination thereof? Would it make a difference which memory I added first, and what would be the most efficient first addition?

Russell C. Waters

Perhaps you could start off by asking, "How much memory do I need?" Many commercially available games, word processors, financial programs, and so on will state on their packages something like: "Requires 3K Expansion," or "Requires At Least 8K Expansion." The best answer to this question is to buy what your specific needs demand. You may never require more than 8K, 3K, or even the standard 5K.

If you plan to expand your VIC to large amounts of memory – 16K, 24K, or the full 32K – it is usually more economical to buy it all at once on a single plug-in expander. One 16K expander is usually less expensive than two 8K expanders. A single expander also is easier to use; two or more smaller expanders would require a special expansion board with enough extra slots to plug them in at once.

If you are interested in programming, or if you use BASIC programs written by others, there is something else to consider when adding memory to the VIC: the screen and color RAM locations can change. Screen and color RAM are the areas in memory where you can use the POKE statement to place characters and colors on the TV screen. (For an explanation of screen and color RAM, see "Commodore 64 Video Update" elsewhere in this issue.) The PRINT statement works the same on all VICs, but if you POKE to the screen, you must adjust your programs to work on the various memory configurations.

In the unexpanded VIC, the screen memory starts at location 7680 and ends at 8191, and the color memory is located from 38400 to 38911. When you add the 3K expander or the Super Expander, these locations do not change. However, if you add 8K or more of expansion memory, the locations do *change. Screen memory will reside from 4096 to 4607, and color memory will move from 37888 to 38399.*

This could cause some minor difficulties if, for instance, you have a program that was written for the unexpanded VIC, and you try to run it in a VIC with 8K or more expansion. It might try to POKE characters to the screen at the unexpanded locations (7680-8191), but the screen is now at 4096-4607. This would cause some errors, and could cause the program to abort.

Here is a formula you can use in your BASIC programs to automatically set your screen and color memory locations:

```
10 SC=7680:CL=38400:IF 4*(PEEK(36866) AND 1
   28)+64*(PEEK(36869) AND 112)=4096 THEN SC
   =4096:CL=37888
```

This formula will set the variables for the screen memory (SC) and color memory (CL) to the proper values. For example, if this were run on a VIC with 8K or more expansion, SC (screen) would be set to 4096, and CL (color) would be set to 37888. Then, whenever POKEing to screen or color memory, you would use these variables.

If you are having problems with a VIC program, this "moving memory" might be the culprit. If you have 8K or more expansion, try the program without the expander; likewise, if the program fails on a VIC with less than 8K, try plugging in an expander.

Computer Compatibility

If I buy pre-programmed cassettes from Timex or Atari, can I play them on my VIC-20? If I can, do I need an adapter?

Robert McClenahan

Unfortunately, programs on cassette or disk for one type of computer are not compatible with other computer brands. If a program is not specifically labeled for your computer, it will not load into memory.

Timex and Atari, for instance, record programs on tape (and disk) in formats which Commodore computers cannot recognize. Similarly, Commodore tapes cannot be loaded on Timex or Atari computers.

If you can find a program listing *– a printout of a BASIC program – you could try typing it into your computer and modifying it to work. Although different computers use different versions of BASIC, they are remarkably similar. But unless you are knowledgeable about both computers, you might have to spend some time adjusting things, especially aspects of the program which involve the TV screen.*

Computers made by the same company usually have more in common. Tapes and disks for Commodore PET computers will load on VIC-20s and Commodore 64s. With a few modifications, they can usually be made to work. Commodore plans to sell an adapter, called a PET Emulator, *which will allow the 64 to run almost all PET programs.*

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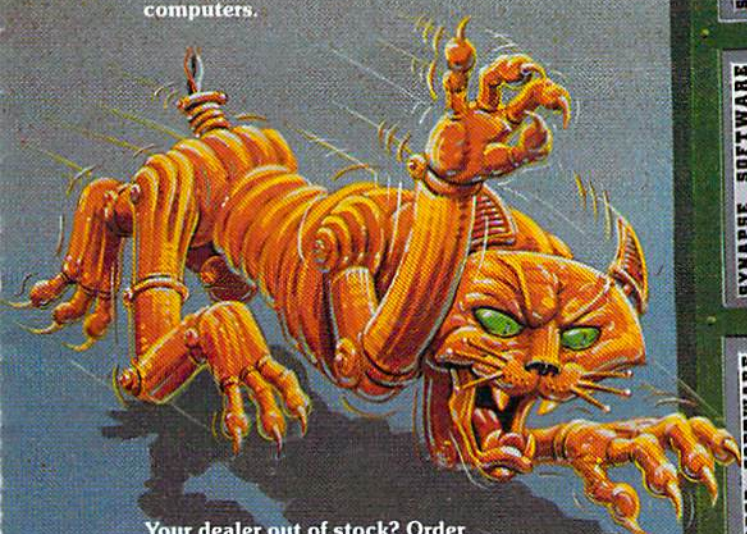

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COMPUTE!'s Gazette for Commodore

AUTHOR GUIDE

COMPUTE!'s Gazette for Commodore is looking for interesting, useful articles aimed at beginning to intermediate VIC-20 and Commodore 64 users. If you have an article idea or a good original program, we'd like to see it. Don't worry if you are not a professional writer. We are more concerned with the content of an article than its style. Simply try to be clear in your writing and check your program for any bugs.

COMPUTE!'s Gazette for Commodore is a consumer-oriented magazine for VIC-20 and Commodore 64 users who want to get the most out of their computers in a non-technical way. It is aimed primarily at home users, not all of whom necessarily want to become expert programmers. If your article covers a more advanced or technical topic, you may choose to submit it to our companion publication, **COMPUTE!**. If you submit an article to one of our magazines and we believe it would be more suitable to the other, we will transfer your submission to the right editors. The basic editorial requirements for publication are the same for both magazines; so are the payment rates.

The following guidelines will permit your good ideas and programs to be more easily edited and published. Most of these suggestions serve to improve the speed and accuracy of publication:

1. The upper left corner of the first page should contain your name, address, telephone number, and the date of submission.

2. The following information should appear in the upper right corner of the first page. If your article is specifically directed to either the VIC-20 or Commodore 64, please state which one. In addition, please indicate the memory requirements of programs.

3. The underlined title of the article should start about 2/3 of the way down the first page.

4. Following pages should be typed normally, except that in the upper right corner there should be an abbreviation of the title, your last name, and the page number. For example: Memory Map/Smith/2.

5. Short programs (under 20 lines) can easily be included within the text. Longer programs should be separate listings. *It is essential that we have a copy of the program, recorded twice, on a tape or disk.* The tape or disk should be labeled with your name and the title of the article. Tapes are fairly sturdy, but disks need to be enclosed within plastic or cardboard mailers (available at photography, stationery, or computer supply stores).

It is far easier for others to type in your program if you use CHR$(X) values and TAB(X) or SPC(X) instead of cursor manipulations to format your output. For five carriage returns, FOR I = 1 TO 5:PRINT:NEXT is far more "portable" to other computers with other BASICs and also easier to type in. And, instead of a dozen right-cursor symbols, why not simply use PRINT SPC(12)? A quick check through your program – making these substitutions – would be greatly appreciated by your editors and by your readers.

6. If your article is accepted and you have since made improvements to the program, please submit an entirely new tape or disk and a new copy of the article reflecting the update. We cannot easily make revisions to programs and articles. It is necessary that you send the revised version as if it were a new submission entirely, but be sure to indicate that your submission is a revised version by writing "Revision" on the envelope and the article.

7. All lines within the text of the article should be spaced so that there is about 1/2 inch between them. A one-inch margin should be left at the right, left, top, and bottom of each page. No hyphens should be used at the ends of lines to break words. And please do not justify. Leave the lines ragged.

8. Standard typing paper should be used (no onionskin or other thin paper) and typing should be on one side of the paper only (upper- and lowercase).

9. Sheets should be attached together with a paper clip. Staples should not be used.

10. A good general rule is to spell out the numbers zero through ten in your article and write higher numbers as numerals (1024). The exceptions to this are: Figure 5, Table 3, TAB(4), etc. Within ordinary text, however, the zero through ten should appear as words, not numbers. Also, symbols and abbreviations should not be used within text: use "and" (not &), "reference" (not ref.), "through" (not thru).

11. For greater clarity, use all capitals when referring to keys (RETURN, TAB, ESC, SHIFT), BASIC words (LIST, RND, GOTO), and three languages (BASIC, APL, PILOT). Headlines and subheads should, however, be initial caps only, and emphasized words are not capitalized. If you wish to emphasize, underline the word and it will be italicized during typesetting.

12. *COMPUTE!'s Gazette* for Commodore pays between $75 and $1000 for published articles. In general, the rate reflects the length and quality of the article. Payment is made upon acceptance of an article. Following submission (Editorial Department, *COMPUTE!'s Gazette* for Commodore, P.O. Box 5406, Greensboro, NC 27403) it will take from four to six weeks for us to reply. If your work is accepted, you will be notified by a letter which will include a contract for you to sign and return. Rejected manuscripts are returned to authors who enclose an SASE. We do not consider articles which are multiple submissions. If you wish to send an article to another magazine for consideration, please do not submit it to us.

13. Articles can be of any length – from a single-line routine to a multi-issue series. The average article is about four to eight double-spaced, typed pages.

14. If you want to include photographs, they should be 5x7, black-and-white glossies.

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SIMPLE ANSWERS TO COMMON QUESTIONS

TOM R. HALFHILL, EDITOR

Q A

Each month, *COMPUTE!'s Gazette* for Commodore will tackle some questions we are commonly asked by new VIC-20/Commodore 64 owners and by people shopping for their first home computer.

Q. ***After purchasing a Commodore 64, I am curious as to the differences in programming the VIC-20 versus the Commodore 64. Is the VIC-20 BASIC the same as the 64's? If not, what changes must be made to run VIC-20 programs on the 64? I have seen several programs listed for the VIC-20, and have not read if they can be used on the 64 or not.***

A. The Commodore 64 does indeed have the same BASIC programming language as the VIC-20. It is a version of the widely used Microsoft BASIC, originally written for Commodore by Microsoft, Inc. Most home computers use some version of Microsoft BASIC. To Commodore users, the version in the VIC-20 and 64 is known as *Upgrade ROM*, or sometimes, BASIC 2.0. Upgrade ROM derives its name from the fact that it is an upgraded version of the BASIC found in the original Commodore PET computer introduced in 1977. The BASIC is stored in a Read Only Memory (ROM) chip which was upgraded in later PETs. Commodore chose to equip the VIC-20 and 64 with this upgraded version. Some other Commodore computers have an even newer version, known as BASIC 4.0.

So what does all this mean to the VIC-20 and 64 programmer? Fundamentally, the BASICs are the same. But this *does not* mean that programs written for one computer will automatically run on the other.

The problem is that the VIC-20 and 64, though nearly identical in appearance, are very different computers inside. One major difference is their memories. Of course, the 64 comes with more than a dozen times as much memory as the standard VIC. But the differences go even deeper. The internal arrangement of the memory is not the same. For instance, the *screen memory* – an area of memory set aside for storing characters displayed on the screen – is not in the same place on both computers. This means programs which use screen memory will have to be adjusted, or they will not work.

Another difference is in the way the VIC and 64 create sounds. The 64 has an advanced synthesizer-on-a-chip which is much more flexible (and complicated) than the VIC's tone generator.

Still another difference is in the two computers' screen formats. The VIC can display only 22 characters across the screen, while the 64 displays 40. Programs written for one computer will not work, or at least will look very strange, if run on the other computer.

There are other, similar, differences. Translating programs between the two computers is basically a matter of tediously resolving these differences. It will be easier to convert VIC programs for the 64 than vice versa, since the 64 has special features not available on the VIC.

We intend to have continuing coverage of this subject in *COMPUTE!'s Gazette* for Commodore. Also, when we publish programs for the VIC and 64, whenever practical we will print a translated version for the other computer.

Q. ***Can the VIC-20 be upgraded to a Commodore 64? If so, does Commodore plan to make available such an upgrade?***

A. The answer to both questions is a pretty certain "no." Don't underestimate the differences between the VIC-20 and Commodore 64. The two computers appear almost identical – sharing the same housing and keyboard – and some people mistakenly refer to the Commodore 64 as the "VIC-64." But as explained above, the VIC and 64 have significant internal differences. "Upgrading" a VIC to a 64 could more accurately be described as "rebuilding." It would probably cost more in parts and labor than what a new 64 sells for.

However, some upgrades for the VIC are theoretically possible. For instance, the 64's synthesizer sound chip could be built into a plug-in cartridge for the VIC. Also, the microchip which

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is the VIC's central "brain" is capable of addressing a total of 64K of memory, twice as much as the current maximum on the computer.

Commodore has hinted recently that an upgraded version of the VIC is at least a possibility. This might be something as simple as 16K standard memory instead of the current 5K. Whether it actually happens depends partly on the competitive situation in the low-end home computer market, partly on declining manufacturing costs, and partly on what Commodore perceives as gaps in its product line.

Attention Writers

COMPUTE!'s Gazette is looking for well-written, clearly explained articles for beginning and intermediate users of VIC-20 and Commodore 64 personal computers. If you have an idea for a feature article or tutorial, submit a manuscript or send us a query letter. See the Author Guide elsewhere in this issue.

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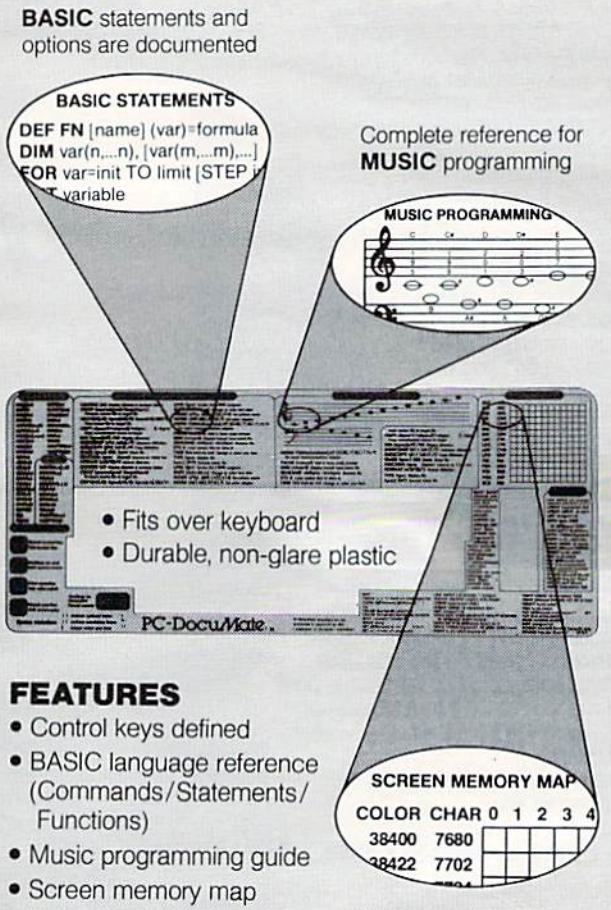

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The VIE and CIE are IEEE 488 interfaces for the VIC 20. When plugged into the expansion port, the cartridge is "transparent," that is, the user can still attach other peripherals without any interference. Devices such as 4040, 8050, 2031, 2032, 4022 and 8023 can be controlled. The IEEE software can be called by using the 'SYS' command, even in the middle of a BASIC program.

The V232 and C232 are serial interface cartridges which allow connection of various input/output devices such as printers, modems, plotters, etc. to VIC 20 or Commodore 64 computers. Features include: positive and negative voltage swings to meet full EIA standards, straps and jumpers to allow reconfiguration to meet pinouts for any RS232 device, and software selectable reconfiguration such as baud rate, parity, and duplex mode.

The VPI and CPI are parallel interfaces for the VIC 20 and Commodore 64. These interfaces provide direct BASIC use of the parallel printer bus and give "invisible" access to the bus. The VPI can be used only on the VIC 20 and uses the expansion port. The CPI will work with both the VIC 20 and Commodore 64 and does not use the expansion port. The CPI also has switches for setting insertion or deletion of line feed, conversion of Commodore ASCII into standard ASCII or visa versa, addresses printer to device 4, 5, 6 or 7, and allows normally unprintable Commodore characters to be printed in a recognizable form.

B Expandoport Series. Expandoport 3 and Expandoport 6 are three- and six-slot expansion boards for the VIC 20. Each slot on the Expandoport 6 has a switch for controlling power to that connector. The switch allows the use of cartridges which respond to the same memory space. The Expandoport 6 also has a fuse and reset switch. The fuse prevents excessive current drain from the VIC 20 and protects it from 'shorts'. The reset switch allows the user to 'Restart' the VIC 20 without turning power off. This feature allows RAM, which is located in the ROM expansion area, to be protected during 'Restart'.

Expandoport 4 is a four port expansion board for the Commodore 64. It has the same features as the Expandoport 6 and even allows for the use of varying width cartridges.

C Terminal Pak Series. The VTE 40 Terminal Emulator (VTE 40) is a hardware and software package which converts the VIC 20 into a 40-column communications terminal. The VTE 40 cartridge is complete. Various set-up parameters such as baud rate, parity, duplex, and bits per character can be selected through a 'menu' format. VTE 40 features are: 40 x 25 text display, user definable communication specs, smooth or normal scroll, print information to printer or disk, generation of control codes, selective omission of data, continuous status line.

The CTE/VTE Terminal Emulator (CTE/VTE) is a software program which converts the VIC 20 or Commodore 64 into a terminal. The user can 'software select' the baud rate compatible with the modem used. Full upper and lower case characters are supported.

D Audio Link. An audio cassette adapter interface for the VIC 20. Features include: use of regular cassette recorders, conversion of VIC 20 digital data to audio and visa versa, normal and inverted cassette signal, remote on/off control and control of external devices.

E VRAM. These memory expansion modules are designed to provide additional user programming space for the VIC 20 system. VRAM plugs into the memory expansion port and requires no additional power or modification to the VIC 20 system. The units are packaged as 3K, 8K, 16K and 24K modules. Strapping is provided for mapping 8K blocks of memory into the various available memory blocks.

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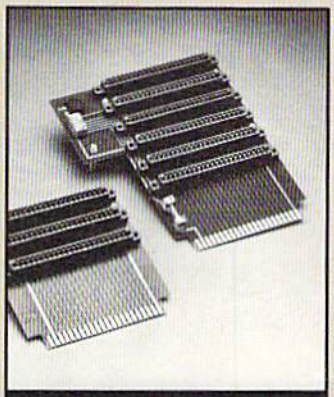
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THE BEGINNER'S CORNER

C. REGENA

Learning To Program In BASIC

I'm happy to be writing a monthly column on beginning programming for the VIC-20 and Commodore 64 computers. I own several microcomputers and have published programs and articles in several national magazines for the TI-99/4A, TRS-80 Color Computer, and VIC-20 computers, and I publish "TIdbits" for the TI-99/2. I have also written two books on programming BASIC, one for the TI-99/4A and one for the TRS-80, which are published by **COMPUTE! Books**.

I enjoy programming and helping others learn how much fun it is to get a computer to do what *you* want it to do. The main goal of this column will be to discuss programming concepts as they apply specifically to Commodore's BASIC which is built in the VIC-20 and Commodore 64. With each column, I'll try to include a short program for you to type in and RUN.

In future columns, I'll try to cover interactive programming, colors, graphics, sounds, DATA statements, arrays, built-in functions, strings, and programming techniques and hints to help you with your own programming. I'll assume you have available the guide that comes with your computer. If you want more advanced information, you should have the VIC or 64 *Programmer's Reference Guide* published by Commodore. Have your computer handy while you read my articles, and actually try things on your computer while you are reading.

I'll rarely mention hardware (another section of this magazine will cover that) unless it is really necessary for a particular application. But you should have the Commodore Datassette or a 1540/1541 disk drive to save your programs for later use. All programming in this column can be done on the standard VIC or 64 with no expansion memory or other peripherals.

First, Commands

Let's get started on an actual program. A computer "program" consists of numbered statements or commands. You may type the statements in any order, and the computer will keep them in memory. However, it is less confusing if you type them in the proper order. When the program is RUN, the computer executes the statements in numerical order. If you type a command without a line number, the computer will execute the statement immediately (and the statement will not be saved in memory). This is called *immediate mode* or *direct mode*. When I start to program, I often number the lines in increments of ten – 10, 20, 30, etc. – so later lines may be inserted between existing statements if necessary.

The PRINT statement is one of the easiest to start with. It is used to print something on the screen. At the beginning of a program, I usually like to clear the screen so there is a blank screen to draw a title or start printing. To clear the screen, use the following statement:

```
10 PRINT "{CLR}"
```

In listings in this column, and throughout the magazine, the braces will indicate keys or special function keys to be pressed. In this case, hold the SHIFT key while you press the CLR/HOME key. An inverse heart will be printed.

Now try a few more PRINT statements. Remember, as long as there is a line number before the command, you will not see results until you RUN the program. Remember to press RETURN after typing each line.

```
20 PRINT "HELLO"
30 PRINT "EXAMPLES:"
40 PRINT "HOW ARE YOU?"
50 PRINT
60 PRINT "JOHN";"DOE"
70 PRINT "JANE","SMITH"
80 END
```

Now RUN this program.

You will notice that the screen clears, then

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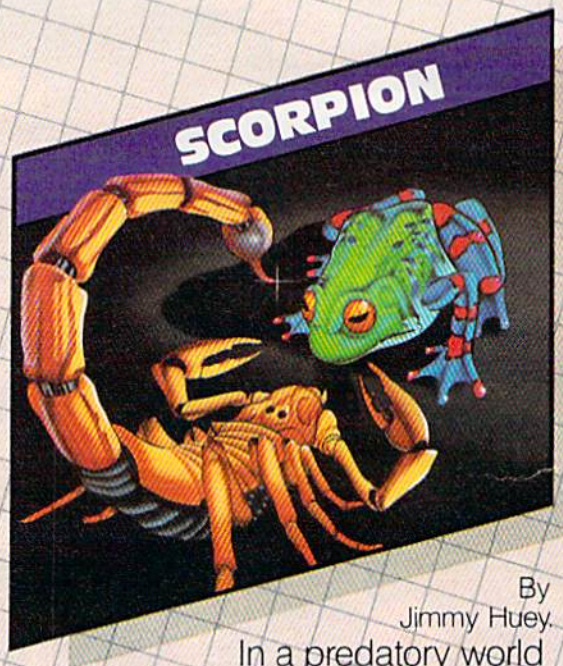

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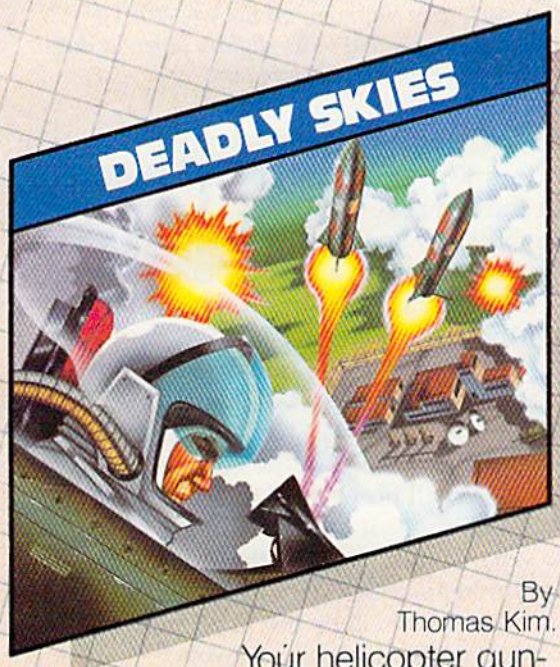

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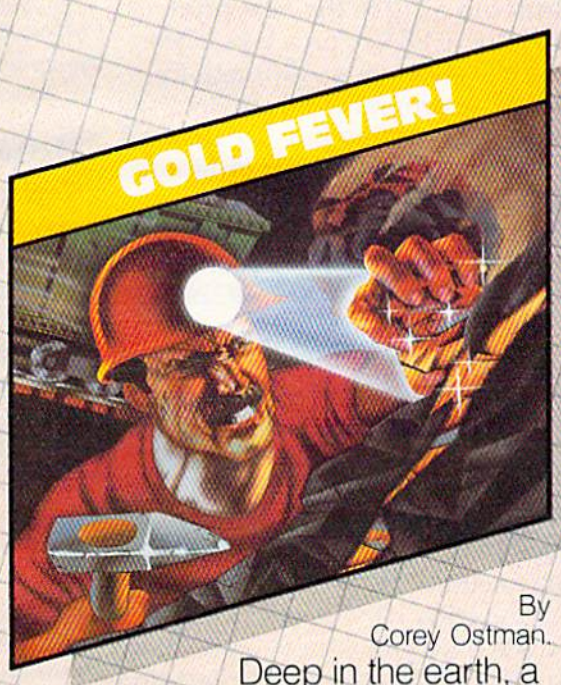

By
Corey Ostman.

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the messages within the quotation marks are printed, starting at the top left of the screen. Each message is on a separate line. The PRINT statement starts a new line and begins printing at the left margin. If you wanted the word HELLO on the top line, you could include HELLO in the quotes of line 10 right after the {CLR}.

Careful With Punctuation

Lines 30 and 40 show that you may print punctuation marks if they are included *inside* the quote marks. Line 50 is just the word PRINT and prints a blank line. Lines 60 and 70 show the difference in printing items separated by a semicolon or a comma (called "print separators"). Notice how they are *outside* the quotation marks. The semicolon puts the second item right next to the first. The comma indicates to print in the next print column, sort of like the TAB key on a typewriter.

Line 80 is an END statement. Although in Commodore BASIC the program will end by itself anyway, it is good programming practice to use END as the very last statement in your program. Some forms of BASIC require it.

Try a few statements with messages of your own in quotes. Notice that if you have a long message, longer than 22 characters on the VIC or 40 characters on the 64, the printing simply goes to the next line. When you are printing messages on the screen, you may use extra spaces between words so that you don't divide a word between two lines.

Another way to print a blank line is to use the down cursor key. Add this line, then RUN:

```
72 PRINT "{2 DOWN}GO DOWN"
```

(Press the down cursor twice. A reverse Q will be printed for the cursor.)

You may use the right cursor key to position words so they aren't at the left column. Try adding this line, then RUN:

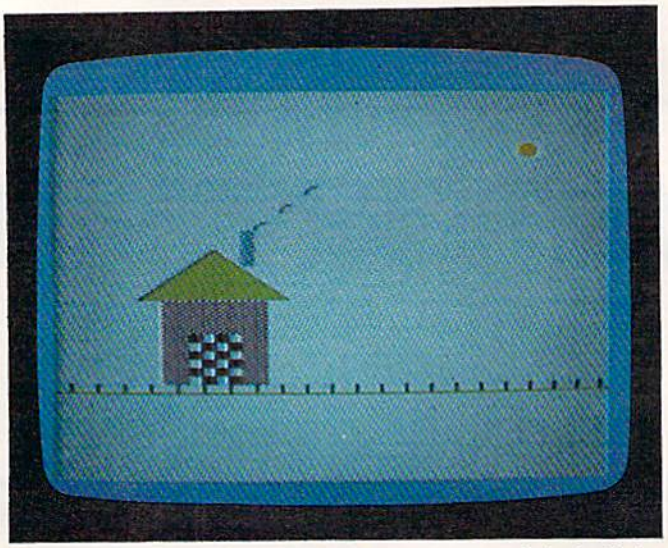
```
74 PRINT "{3 RIGHT}MOVE RIGHT"
```

(Press the right cursor three times. A reverse left bracket will be printed for the cursor. In listings, this may also be expressed as {RIGHT 3}.)

Another way to move something to the right is to use the TAB function. The columns on the screen are numbered 0 to 21 on the VIC, and 0 to 39 on the 64, with the left column zero. You may TAB over to a certain column, and your printing will start in that column. Add this line and RUN:

```
76 PRINT TAB(6);"SIX"
```

You can see there are many ways to print. Different methods or combinations of commas, semicolons, TABs, and cursor controls will accomplish the same visual effect. Some methods may use more memory (and that's a subject of a whole column), but there is really no "wrong" way if the end result is what you want it to be.



The sample program uses PRINT statements and the built-in graphics characters to create this scene on the VIC-20. The program also works on the 64, but looks slightly different due to the screen variations between the computers.

Now, Color

Now let's add some color. Changing colors is very easy to do on the computer.

First type NEW, then press RETURN to get rid of the old program and start a new program. If you also want to start with a clean screen, press SHIFT and CLR/HOME.

To change colors in a program, you still use the PRINT statement, but press CTRL and one of the color keys on the top row of keys just before the word you want printed. Be sure the color is inside the quote marks. You'll notice that the color keys print an inverse symbol – it may be difficult for us to remember what symbol goes with which color, but the computer keeps track with just the one symbol. Whatever you print will be the new color until you change colors again. Here is a sample.

```
10 PRINT "{CLR}"
20 PRINT "HELLO"
30 PRINT "{RED}THIS IS RED."
40 PRINT "{GRN}THIS IS GREEN."
50 PRINT "{BLK}"
60 END
```

As you are programming, your cursor will not change colors. You are writing statements that tell the computer to change colors when you RUN the program. By the way, if the cursor does change colors while you're typing, it means you have made a typing error and did not put the color change within quotes. The easiest thing to do is press RETURN and type the line over.

Now RUN the program. Notice that line 50 said to print in black. The next line ends the program; since I didn't return to blue, all printing now will be black. If you really want to get back to blue, press CTRL and BLU. CTRL and RVS ON will make the letters print with reversed colors, and CTRL RVS OFF returns the printing to normal.

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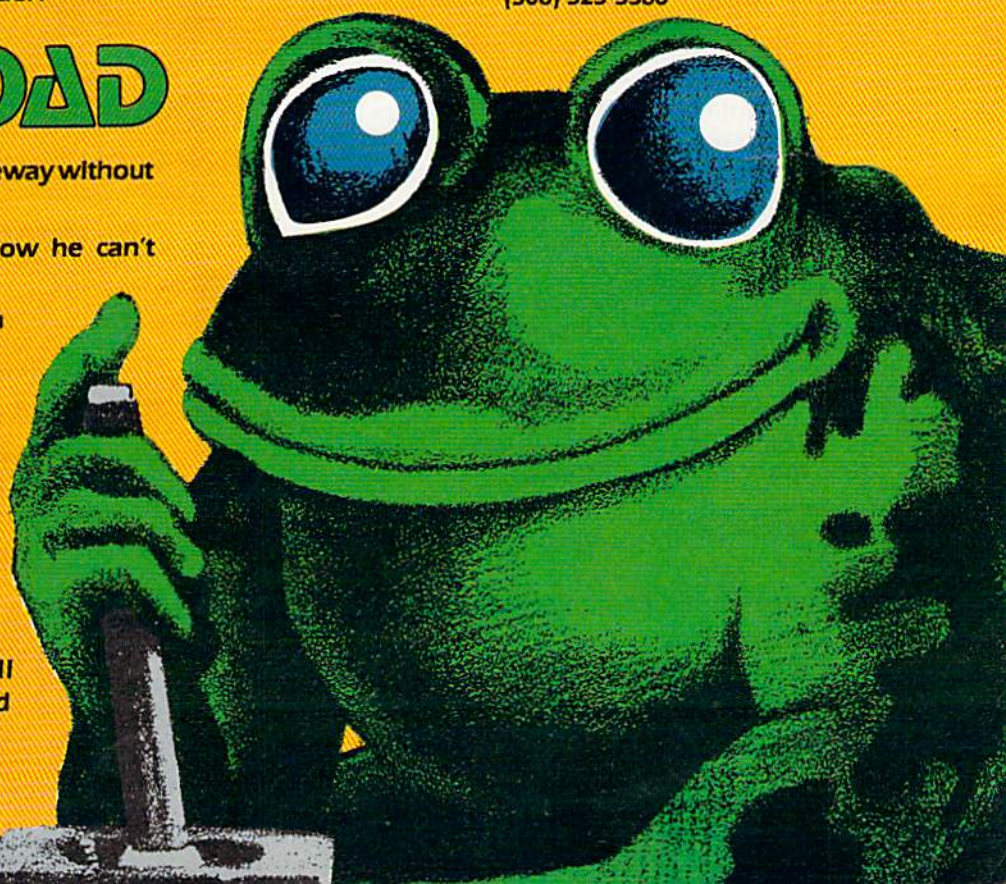

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Note: To save typing effort and memory, you may leave out the space after the line number and after the word PRINT. To abbreviate the word PRINT and save even more memory, use the question mark. Line 20 above may be typed:

```
20?"HELLO"
```

If you list the program, even though you used the question mark, the listing will show the word PRINT. However, the computer remembers the question mark (or "token"). If you are typing in listings from this magazine, you may freely substitute the question mark for the word PRINT.

Enough Words

Let's get to graphics. You have probably already discovered that SHIFT plus a key will print the symbol on the right face of the key, and the Commodore key plus a key will print the symbol on the left face of the key. To draw graphics in a program, just PRINT combinations of graphics symbols.

I usually like to sketch on graph paper the picture I'm going to draw. For the VIC, either mark off graph paper in 22 columns by 23 rows or use a copy of page 144 in the VIC manual. For the 64, mark off graph paper in 40 columns by 25 rows. Sketch your picture on the graph paper, then try to decide which graphics characters would best fit your design. Use colored pencils to make it more attractive.

Now for your program, go down the graph paper line by line with PRINT statements to match the graphics. Remember, you may change colors before any printed graphics character. You may also want to experiment with CTRL RVS ON. By the way, once you turn the reverse ON, all characters in that set of quotes will be reversed unless you turn it back OFF. The next PRINT statement, however, will automatically return characters to normal. Rather than using separate PRINT statements, it may be more convenient to use the cursor keys to move around as you draw. To move the cursor up or left, be sure to press the SHIFT key as you press the appropriate CRSR key.

To keep your design on the screen without the word READY appearing at the end of the program (or without scrolling), use a line such as

```
900 GOTO 900
```

To stop the program, press the RUN/STOP key. Line 900 here tells the computer to go to line 900, which just keeps the computer endlessly looping on that line until you "break" or STOP the program.

Here is a simple graphic design using PRINT statements. You may type it in and try it – but by next month's issue you should be proficient in your *own* graphics or printing programs.

Line 10 clears the screen and moves down two lines. Line 30 illustrates the use of cursor keys rather than separate PRINT statements. Line 40 is the Commodore key and the minus sign. Line 50 uses two reversed characters, then CTRL RVS OFF to get back to normal. Line 70 uses spaces to move over three spaces. You could also use the right cursor to move over. Line 130 will print the symbol across the screen. Line 140 holds the picture on the screen until you press STOP.

See program listing on page 114.

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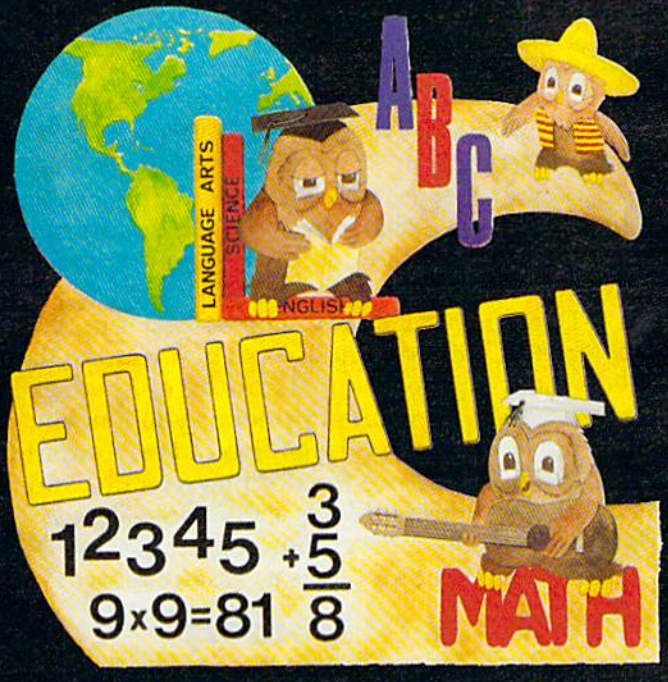

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Does Your Computer Need A Cassette Recorder?

Tom R. Halfhill, Editor

Maybe you're shopping around for your first home computer, or perhaps you've just bought a new VIC-20 or Commodore 64. Usually the advertised price does not include any "extras." Probably the salesperson tried to sell you a cassette recorder to plug into the computer. But what accessories, if any, do you really need? What is a cassette recorder good for? Most new home computer owners do end up buying a recorder, and here's why.

Those magazine and newspaper advertisements sure make home computers look attractive: VIC-20 computers are selling for less than half their price of two years ago, and prices of Commodore 64 computers have plunged about $200 since Christmas.

But does a $149 computer really cost $149? As you've probably already discovered, it really costs only $149 if you can resist the sales pitch to buy some *software* (programs) and *peripherals* (accessories). You might be thinking that this is just another sales gimmick – advertise an inexpensive computer, then tack on all kinds of expensive extras. Naturally, it is a salesperson's job to sell. But the fact is, if you want to get the most out of a home computer, you *will* need at least some programs and peripherals.

Programs And Peripherals

Without programs, a home computer is little more than a fancy calculator. A computer needs programs the way that a game machine needs cartridges, or a stereo needs records or tapes. Since a program is just a series of instructions which tell a computer what to do (and how to do it), you choose programs based on what you want to do with the computer. If you bought the computer to play games, keep track of your household budget, and help teach a child the alphabet, you'll need some game programs, a budget program, and educational programs.

Deciding which peripherals to get is not much different. Once you know what you want to do with the computer, you'll know (or at least be prepared to ask) what peripherals you'll need. The most common peripheral found on computers is some sort of device for storing programs and other information for later use – a *mass storage* device. And the most common mass storage device for home computers is a cassette recorder.

Two Kinds Of Memory

Without a mass storage device, you have no way of storing programs while the computer is not in use. The part of a computer's memory where programs are run – *Random Access Memory* (RAM) – is erased whenever the power is turned off. That's because RAM chips need a constant flow of electricity to maintain their information. Each time a

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computer is turned on, the program you want to run must be entered into RAM from a mass storage device. Without such a device, there are only two ways to enter a program – plug in a cartridge, or copy it from a program listing by typing it on the keyboard.

Cartridges are the easiest way to enter programs. They are quick, handy, and require no additional devices. Cartridges contain a circuit board with *Read Only Memory* (ROM) chips. Unlike RAM chips, ROMs permanently store their information even when power is turned off. Plugging in the cartridge allows the computer to read the chips and run the program. Since the computer can read the chips directly – as if they were built into the computer – the program enters the computer's memory instantaneously.

On the other hand, typing a program listing on the keyboard is the hardest way to enter a program into a computer. The program must be typed exactly as listed, or it probably will not run correctly. A very long program could take a couple of hours to type in. And when the computer is turned off, the program is erased and all your work is lost. That's why you need a mass storage device.

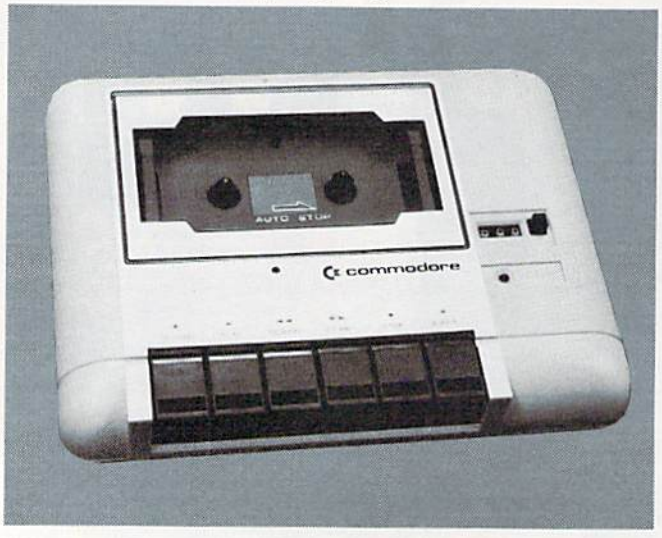
There are two main types of mass storage devices: cassette recorders and disk drives (for an explanation of a third type, Stringy Floppy drives, see this month's review of the Exatron Stringy Floppy elsewhere in the magazine). Each type of mass storage device has its advantages and disadvantages. Cassette recorders are the least expensive of these devices and they are the most popular with home computers.

Putting Them In Storage

In general, though, all these devices share one thing in common – they allow you to save a program for later use by copying it from the computer's memory onto tape or disk. For example, to save a program onto tape with a VIC-20 or Commodore 64, you can simply type SAVE and press the RETURN key. When a cassette is inserted in the recorder and the PLAY and RECORD buttons are pressed, the computer converts the program in its memory into sound pulses – something like Morse code – and records them on the tape. Once the program is saved, you can safely shut off the computer. When you want to run the program again at a later time, you type LOAD, press the RETURN key, insert the cassette into the recorder, and press the PLAY button. The computer then reads the program off the tape and loads it into memory again. The program remains on the tape and can be used over and over until it is erased.

With Commodore computers, you can also save programs on tape with a *filename*. This is a title, up to 16 characters long (including spaces), that sets a program apart from others on the same tape. For example, you can save a program on tape by typing SAVE "PROGRAM ONE", pressing the RETURN key, and pressing the recorder's PLAY and RECORD buttons. The program is saved on tape under the title "PROGRAM ONE" (note that because spaces are counted as characters, this is an 11-character filename). If it happens to be the first program on the tape, you can load it by just typing LOAD as usual. But if there are many programs on the same tape, you can find it by typing LOAD "PROGRAM ONE". The computer will search the tape until it finds "PROGRAM ONE", and then load it.

Disk drives work in a similar way, only much faster than cassettes. On the VIC-20 and Commodore 64, you use the same SAVE and LOAD commands, except that programs saved on disks must always be given a filename. Also, a comma and the numeral "8" must be appended to the SAVE



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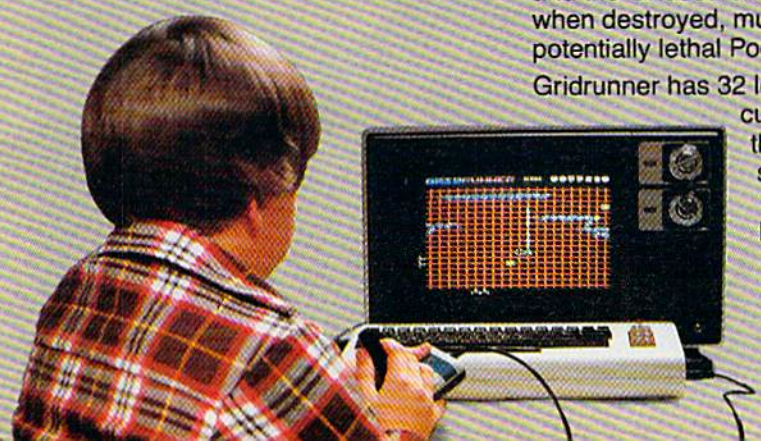
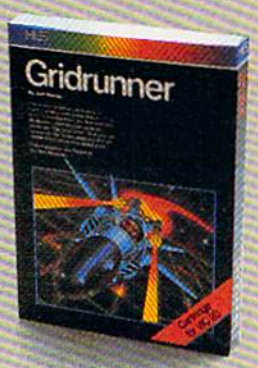
As the pilot of the Gridrunner, a combat ship, you must annihilate the various enemies traveling along the "Grid." High scores are possible only through the mastery of the patterns of the X/Y Zappers and the Gridsearch Droids which, when destroyed, mutate into potentially lethal Pods.

Gridrunner has 32 levels of difficulty (20 levels in the VIC 20 version). To this date, the 13th level has been the highest achieved.



Gridrunner is available for VIC 20, Commodore 64 and Atari 400/800.



Can you beat Gridrunner? See your local computer or games dealer and find out.

Human Engineered Software
71 Park Lane
Brisbane, CA 94005

HES
a division of USI

STAR TECH

ARCADIA

Eight screens each more difficult than the last, ultra fast action with superb color and sound, for the expert game player only. This game is very hard indeed to master. Each screen a different opponent, with unique battle tactics and missiles. You will not tire of this game in a hurry.
Cassette $24.00
Un-expanded VIC 20
Keyboard or Joystick

VICMEN

A very fast action game based upon the familiar maze theme, supercharger dots, point dots, random fruit bonus, extra life after 1500 points, high score held, music, sound effects, etc. All this on an un-expanded VIC 20 in super fast high resolution graphics.
Cassette $24.00
Un-expanded VIC 20
Keyboard or joystick

PANIC

A ladder and platform environment where aliens pursue a shovel wielding crew member around the screen. Armed only with a space shovel set traps for the aliens by digging holes in the platforms then pound them to death with the shovel. Multiple screen, hi score, unlimited play, three alien types.
Cassette $24.00
Un-expanded VIC 20
Keyboard or Joystick

VIC 20™

commodore 64™

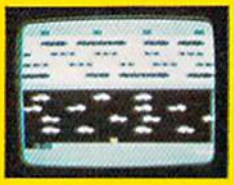
STAR TECH

VIC 20™

commodore 64™

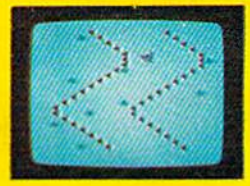
METEOR

Your ship is being approached by deadly meteors, your long range scan locates approaching meteor and indicates range. Your task is to spot the approaching meteors destroy it with laser fire before impact. Beautiful graphics, damage indicator, full color hi-resolution graphics and sound.
Cassette $12.00
Un-expanded VIC 20 or Commodore 64
Keyboard or Joystick



BUNNY

Using the joystick move the bunny across four lanes of speeding traffic, dodging trucks and cars. Then hop across a swiftly flowing, piranha infested river by jumping on floating logs and friendly turtles to safety. Full color high resolution action game with sound effects.
Cassette $20.00
Un-expanded VIC 20 or Commodore 64 Joystick required



SKI-RUN

Three different games in one, Downhill, Slalom, Giant Slalom. Each game with nine skill levels. A race against the clock for the fastest time. In Downhill, dodge the many trees and snowdrifts keeping between the pathmarkers. Slalom adds a new dimension to the game with Slalom gates.
Cassette $20.00
Un-expanded VIC 20 or Commodore 64 Keyboard only

STAR TECH

BACKGAMMON

The traditional game we all know. You versus the computer. Human wits against the power and logic of a computer. Three levels of play, beginner, novice, expert. Single keypress commands for your moves, full color graphics with sound effects. The computer plays a very strong game.
Cassette $24.00
Commodore VIC-20 with 3K RAM Commodore 64

ASTEROIDS20

Pilot a ship in the midst of an asteroid belt, destroy all of the asteroids before they smash the ship. A game for the novice and expert. The game starts with two asteroids and increases with each screen cleared up to 100. Smashed asteroids split into smaller ones, auto increase of 255 speed levels.
Cassette $24.00
Un-expanded VIC 20
Keyboard or Joystick

COSMIADS

A fast action game, multicolored aliens of different types break out of formation at random and attack your laser base firing their own deadly missiles. Full color, super fast action with the most superb sound effects. Features bonus mother ship etc.
Cassette $24.00
Un-expanded VIC 20
Keyboard or Joystick

VIC 20™

commodore 64™

VIC 20 AND COMMODORE 64 ARE TRADEMARKS OF COMMODORE BUSINESS MACHINES INC.

AVAILABLE AT YOUR LOCAL STARTECH STARBASE OR IF IN DIFFICULTY DIRECT FROM:

STARTECH INC. 13450 MAXELLA AVE., BUILDING G 185, SUITE 200 MARINA DEL REY, CA 90291 (CALIFORNIA RESIDENTS AD 6½% SALES TAX.)

and LOAD commands: SAVE "PROGRAM ONE",8 or LOAD "PROGRAM ONE",8. The numeral "8" is a *device number* which tells the computer that the command refers to the disk drive, and not the cassette recorder.

Why A Datassette?

Mass storage devices make computers so much more useful that most people consider them indispensable. Without one, you would have to buy all your programs on cartridges or else type them on the keyboard for each use. With a cassette recorder or disk drive, you can buy commercial programs on tapes or disks, which are more common than cartridges. You can also accumulate a program library by trading programs you've written with friends, typing and saving programs from magazines, and saving your own programs.

Since cassette recorders are much less expensive than disk drives – averaging about $75 versus $375 – most home computer users choose tape over disk, at least for starters. There are many other factors to weigh besides cost when deciding between cassette and disk, and we'll explore these alternatives further in future articles. Most people who have disk drives also own cassette recorders anyway, either because they started with one or because some commercial programs are only available on cassettes.

So let's assume that you're interested in adding a cassette recorder to your VIC-20 or Commodore 64. Which one should you buy?

There's not much to consider, because Commodore users basically have only one choice – the Commodore Datassette. The Datassette is a special cassette recorder made by Commodore specifically for Commodore computers. Some home computers, such as the Texas Instruments TI-99/4A and Radio Shack TRS-80 Color Computer, can use ordinary, high-quality audio cassette recorders. But these recorders will not work with a VIC-20 or 64 (although some companies make adapters for this purpose). Commodore elected to design a system which requires the Datassette.

Contrary to the opinion of some skeptics, this decision wasn't just a scheme to force Commodore users to buy their recorders from Commodore. Because the Datassette is optimized for computer use, it is more reliable than most cassette recorders on other computers. With good tape, and proper maintenance of the Datassette, programs are almost never lost by accident.

If you want to get the most out of your VIC-20 or 64, you should seriously consider buying a Datassette or disk drive. Without one, your selection of programs – and therefore, the number of applications for your computer – is very small. But with one, there are as many uses for your computer as there are programs.

★ ★ ★ COMMODORE'S SX-100 PORTABLE! ★ ★ ★
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1) You buy one from us at $389.95
2) You buy one from us at $389.95, then you send in an old/new (in any condition) computer or TV game to Commodore & receive $100.00 from them!
3) You buy one Commodore64 from us at $389.95 Then you buy one Timex TS-1000 from us for $44.95 Then send the Timex to Commodore & get $100.00. You invest $44.95 & get $100.00, net gain: $65.05

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40 Column Card	w/8K mem built-in for VIC-20	139.95
Video Pack 64K	For VIC-20	329.95

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1525E	Printer	339.95	VIC-20 as well as
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Each cassette includes two YORK 10 labels only. Boxes are sold separately. Shipments are by U.P.S. unless Parcel Post requested. Boxes, caddies, and blank labels are free of shipping charges when ordered with cassettes. When ordered without cassettes, shipping charges: Boxes—$1.00 doz., Caddies—$1.00 each. MINIMUM SHIPPING/HANDLING ON ANY ORDER—$2.00.

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COMPUTING

FRED D'IGNAZIO

for kids

Computer Adventures

You can use this corner of *COMPUTE!'s Gazette* as a launch pad to send you blasting away each month on a new computer adventure with your VIC-20 or your Commodore 64 computer.

One month I'll show you how to set up a secret phone line between your computer and your friends. We'll see how you can invent a secret language on your computer that only your friend can decode. You can send each other messages and play games, all in your secret language.

Another month I'll show you how to set up video games on your computer. Then I'll show you how to use the video games to help you with your homework.

Let's spend at least a couple of months using our computers to create adventure games and dangerous missions. I'll show you how to invent games where you get to be the hero and fight evil creatures and discover fantastic treasures.

We should also spend some time trying to answer some popular questions kids have about computers. For example:

Should I learn to program?

Which language is best – BASIC, Logo, or PILOT?

What kind of computer career should I aim for?

Are video games good for you or bad?

How can I lobby for more computers in my school?

Why are my parents scared of computers?

How can my computer help me study?

Who's better at computers – girls or boys?

Also, in a section entitled "Can You Imagine?" I'll tell you about some of the latest developments in computers and some of the exciting things you can expect in the future.

Who's Out There?

And I'd like to get to know you. Write and tell me who you are and why computers turn you on. I want to hear from you. It may take me awhile, but I'll always write back.

If you have any good programs, tricks, or ideas, write and share them with me. I'll print the best ones in this column each month under the heading: "Kids Know Best."

Also, if I say something that makes you mad, write me and tell me why. You can reach me by writing:

Fred D'Ignazio
c/o *COMPUTE!'s Gazette* for Commodore
P.O. Box 5406
Greensboro, NC 27403

This column is for everyone – big kids, little kids, fat kids, skinny kids, and kids with green polka dots on their feet. I want it to be the column you turn to every month as soon as you get your new issue of the *Gazette*. You can help me do this by writing and telling me what you most want to see.

Who Am I?

Who am I?

I'm a computer nut. I love computers – even more than pizza, steak sandwiches, or spaghetti.

Once, several years ago, my wife bopped me on the head with a pillow because she was jealous of my computer. Actually it wasn't a computer, it was a computer terminal that talked on a telephone with a big computer thousands of miles away. The terminal was neat because it fit into a briefcase. I used to stay up all night programming the computer on the kitchen table. Lots of nights I got so carried away, I forgot to go to bed.

STEP BY STEP

A Programming Course For Beginners

What is the best way to learn how to use your **PET**® or **COMMODORE 64**® computer?

You could enroll in a class—arranged at someone else's convenience, given by a technician who may not be a very good teacher. Or you could read a book—written by a programmer who may not be a very good writer. Or you could learn in your own home, on your own computer at your own convenience, using the course that has become a standard of the industry.

Introducing STEP BY STEP, a programming course for beginners

In 1978, PDI introduced the original *Step by Step*. The student learned by interacting with his or her computer. Thousands of students learned how to use a PET computer and the **BASIC** language with *Step by Step*. Now the course has been revised and updated. Versions are available for both **PET** cassette and disk. A version for **COMMODORE 64** will be ready by the time you read this ad.

How does STEP BY STEP work?

The computer program shows screen displays or sample programs. After each instructional segment, the student is asked a question or asked to solve a problem. The computer checks the student's work.

The student uses the *Step by Step* workbook to review and practice the material covered in the lesson. After the practice assignment has been completed, the student takes a quiz.

Periodic exams are given.

What does STEP BY STEP teach?

There are about twenty hours of instruction. Topics covered include:

- Writing simple programs
- PRINTing Characters
- Mathematics
- PRINT Statement
- RUN, LIST Commands
- SYNTAX ERRORs
- STOP, END Statements
- NEW Command
- Numeric Variables
- INPUT Statement
- GOTO, IF . . . THEN Statements
- ON . . . GOTO Statement
- Relational Operators
- Counting, REM Statements
- INTeger, ABSolute, RaNDom Functions
- PRINT Formatting: Comma, Semicolon, and TAB
- String Variables
- GOSUB Statement
- READ, DATA, RESTORE Statements
- FOR . . . NEXT Statement
- Arrays
- DIM Statement
- Nested Loops
- PRINT Formatting
- Cursor Control Keys
- Lower Case Letters
- Graphics-Animation
- Multiple Line Statements
- FRE Statement
- Scientific Notation

How can STEP BY STEP be used?

Schools can use *Step by Step* for individualized instruction in programming in **BASIC** and in computer literacy programs.

Families can use *Step by Step* to ensure that all family members can use the family computer.

Businesses can use *Step by Step* to train their personnel.

COMMODORE dealers can use *Step by Step* to introduce prospective customers to either the **PET** or **COMMODORE 64** computer.

Step by Step is available at retail outlets or from PDI.

The cost?

PET version on cassette	$49.95
PET version on disk	59.95
COMMODORE 64 version on disk	59.95

Add $3.00 for shipping and handling.

PDI

Program Design, Inc.
95 East Putnam Avenue
Greenwich, CT 06830
203-661-8799

PET® and **COMMODORE 64**® are registered trademarks of Commodore Business Machines, Inc.

And computer fantasies? Wow! I used to dream of computers even before I ever met one. But now, at long last, my dreams have come true. I have a house full of computers – computers in the bedroom, in the dining room, in my study, and in the play room. This morning I took a computer with me into the bathroom. Yesterday I was really proud because I got six computers running programs, all at the same time. One was playing music, two were talking, one was spitting out words, one was drawing crazy turtle pictures all over the TV screen, and one was controlling a robot.

A Robot Pterodactyl

I have written 15 books about computers and robots, including *Katie and the Computer*, *Working Robots*, the *Star Wars Question and Answer Book About Computers*, and a new solve-it-yourself mystery series. The first book in the series is *Chip Mitchell: The Case of the Stolen Computer Brains*. It just came out this spring.

I really envy the hero of the series, Chip Mitchell. Chip has even more computers than I have. And he has a talking pet robot named Sherwin, 456 snakes, monkeys, lizards, wallaroos, gerbils, and frogs, all living in his bedroom. Of course Chip doesn't have something I have: a pterodactyl robot that sleeps under my desk and nips my knees while I'm writing.

We Were Kids Together

Computers and I go way back. I was born on January 6, 1949, at Bryn Mawr Hospital, just outside Philadelphia. As I was lying in the nursery, crying, slobbering, and gooing along with a dozen other babies, I didn't realize there was another baby just up the road that was already beginning to make history. That baby didn't slobber or cry. With its 20,000 glowing vacuum tubes the size of pickles, it was hot stuff. Who was the baby? It was ENIAC, the world's first modern computer.

As the years went by, computers and I grew up. We were neighbors, but we still hadn't met. I grew bigger, like a normal kid. But while I was growing big, computers grew enormous. By 1959, when I was ten years old, some computers were bigger than a brontosaurus. One computer, the Whirlwind I, in Massachusetts, occupied a two-story building the size of a city block.

During the 1960s I still hadn't heard about computers. But I was getting ready for them. I had a bedroom in the attic of an old stone house. Off the corner of the bedroom was my "Monster's Den." It was really a giant closet, but I called it my Monster's Den because that's where I kept all the creatures I had invented – clay aliens, plastic dinosaurs, and robots made out of old go-cart motors, motorcycle batteries, and dryer hoses.

I read comic books, saw monster movies, and stayed up late for the scary movies that came on TV after midnight.

At night I dreamt about monsters, and about building a machine someday that would obey my orders – just like Dr. Frankenstein's creature. Except not like Dr. Frankenstein's exactly, since his creature didn't listen too well.

Little did I know that I was dreaming about computers. And while I was dreaming, computers were undergoing an almost magical change. They were like Alice in Wonderland. At first, they had grown really big. Then, one day, after eating a piece of cake, they grew very, very small.

What happened?

In California, an engineer named Ted Hoff did the impossible. He squeezed hundreds of computer circuits onto a tiny square of silicon the size of a baby's big toenail. Ted had invented the world's first chip "brain." He had started the personal computer revolution.

This was about the time I first bumped into a computer. I met the computer at college. I taught it to tell me how many Chinese were visiting Latin America. At the time, I thought this was an important subject. The computer added up the number of Chinese visitors and helped me make lots of pretty graphs to impress my professors.

Dreams To Magic Words

I was hooked. When I programmed the computer, I felt like a lion tamer in a circus. With just a few commands, typed into a typewriter, I was able to control a machine that was bigger than my college dorm, and faster than greased lightning.

I especially liked computers because I could control them with words instead of with screwdrivers, wrenches, pulleys, and gears. It made me feel like a magician. If I said the magic word, the computer would turn cartwheels. Of course, sometimes I said the wrong magic word, and the computer stood on its head or rolled over and played dead.

In the 1970s, I went to work for a company programming computers full-time. I worked on a computer in the basement of the Pentagon, in Washington, D.C. Just to get into the computer room each day I had to wear five security badges hanging from my neck like dog tags. My job was so top secret I never even got to see the real data for my programs. All I knew was that my programs had something to do with sending soldiers' socks and underwear all over the world.

The basement of the Pentagon was a gloomy place. Everyone frowned and carried rifles. Pipes hung from the ceilings. After only a couple of weeks there, I devised a plan to escape. One day, I took my briefcase computer terminal, slipped out the back door, and started visiting elementary

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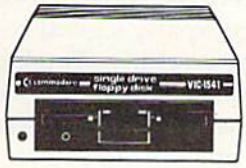

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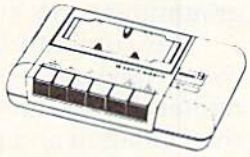

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C-64 Cartridges

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When I arrived in a classroom, I plugged the terminal into a telephone, and the kids and I called up my company's big computer in Chicago. We bought Bob Albrecht's book, *What Do You Do After You Hit Return?*, and we used it to teach us how to program in BASIC.

It was a great thrill. Here we were in a school classroom playing with a company's giant computer. I was supposed to be working. The kids were supposed to be working. Instead we were playing games like *Mugwump*, *Hurkle*, and *Hunt The Wumpus*. It was a nice break from programming socks and underwear.

My company didn't let me stay in the classrooms too long. They decided to use the top-secret military programming skills I had developed at the Pentagon and put me to work programming Bicentennial military bases. I wrote a program that automatically produced a letter to Congressmen congratulating them on having a new Bicentennial military base in their district. When I finally got the program debugged, it was one of my proudest moments in top-secret military programming.

A Bonk On The Nose

Soon after this success, my wife and I moved to North Carolina. We had a baby daughter named Catie. Shortly after Catie was born, I had her sitting at the computer in my study, banging happily on the keys. We used to spend hours in this creative form of free play. One night, however, all of a sudden, Catie lost her balance, fell forward, and bonked her nose on the picture screen.

Oh, how she howled!

My wife came running and yelled at me for almost letting Catie fall into the computer. This was such a good idea for a book that I immediately sat down to write it. Two years and 99 rejection letters later, the book was published. It was called *Katie and the Computer*. It was about a little girl named Katie who fell inside her family's computer and found a magic land known as Cybernia. Katie's adventures inside the computer included riding down a mountain on a bobsled, meeting a ferocious robot spider, parachuting out of an airplane, and getting fired out of a pirate's cannon in the midst of a big glob of goopy green paint.

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Commodore 64 Video Update

Tom R. Halfhill, Editor

There are some ongoing upgrades that are improving the Commodore 64's video quality, and another recent change which is causing problems with some commercial software.

One of the facts of life in personal computing is that new and improved models are constantly coming along. Technology is advancing faster than you can say "state-of-the-art."

Not only is this true of personal computers in general, but also of specific models of personal computers. Many modifications are made between the time a new personal computer is first rigged up on "breadboards," then assembled as a working prototype, then moved into full production, and then dropped from production a few years later when it becomes obsolete. Sometimes entirely new features are added. But usually the changes involve fixing bugs, correcting quirks, and making small improvements. Often the modifications are made quietly, and few outsiders are aware of them.

Both the VIC-20 and Commodore 64 have been undergoing such subtle changes since their introductions. For example, late-model VIC-20s are being shipped with new keyboards. All the same keys are there, and the keys still perform the same functions, but the new VIC keyboard is identical to the one found on the Commodore 64. The keyboard is sculpted into a "dish" shape, like IBM Selectric typewriters, so that keys on the lower rows are tilted slightly toward the top of the keyboard. Older VIC keyboards are "stepped," arranged like flat terraces on a hillside. Also, the new keyboard has pebble-surfaced keycaps to reduce glare. The keyboard upgrade was made a few months ago without fanfare – and went unnoticed by most people.

Problems With Sparkle And Sprites

Numerous other changes have been made to the VIC-20 and Commodore 64, mostly to improve their video quality. Early models of both computers were troubled by TV interference problems, although they passed all applicable Federal Communications Commission regulations. This interference, called *RF* (radio frequency) *interference*, is caused by the stray emissions from computer circuitry. The amount of RF that escapes a computer and interferes with nearby TV sets depends upon the computer's circuit design, internal shielding, and the arrangement of its TV/monitor cable. Also, some TVs are more susceptible to interference than others. RF interference usually shows up on a TV as overall fuzziness, or as "herringbone patterns" (rows of wavy lines, sort of like a weather map).

Recently purchased VICs and 64s show markedly improved video quality over earlier models. Peeking inside their cases reveals that both computers now come with extra metal shielding. Also, their video circuitry has been redesigned to reduce interference.

64s in particular have been extensively modified, mostly because early production models suffered from various video problems, not just RF interference. One of these problems is sometimes called "sparkle." This shows up as flickering points of light on screen characters while a program is running. To test for this, fill up the screen with characters, perhaps by LISTing a long BASIC program. Then, in direct mode (i.e., without using

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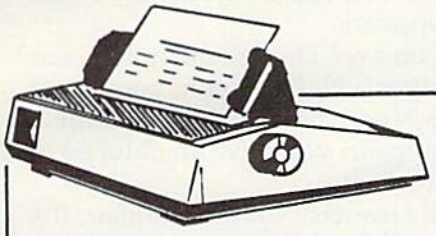

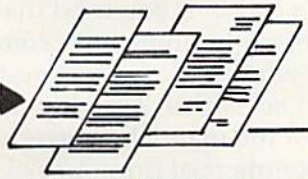

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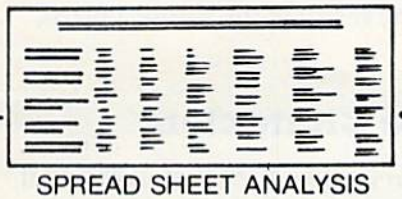

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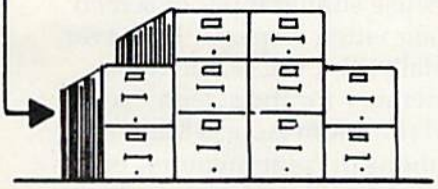

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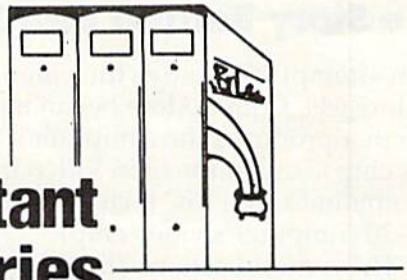

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a line number), type FOR X=1 TO 10000:NEXT and press RETURN. This puts the computer in a running program loop. Watch the characters on the screen for flickering points of light. Early 64s nearly fill the screen with sparkle; on newer models, it is barely noticeable.

Sparkle is more than an annoyance; some users have reported that it interferes with *sprites*, the programmable animated objects that are one of the 64's advanced features. Special memory locations in the 64 detect collisions between sprites and other screen objects, and the sparkle has been blamed for registering collisions when none have occurred.

If you have an early 64 that suffers from serious sparkle or RF interference, there are some possible repairs. However, not all the remedies are sanctioned by Commodore. Some of these repairs involve soldering capacitors and resistors between various pins within the computer, and should be attempted only by qualified personnel. Check with Commodore or your local service dealer if you are having video problems.

The Story Behind Blank Screens

In an attempt to improve the video on early Commodore 64s, Commodore began modifying the chip that produces the computer's TV output. This chip is called the 6566 Video Interface Chip, or sometimes, the VIC II chip (the VIC I is the VIC-20 computer's video chip).

These modifications started soon after the 64 entered production in August/September 1982. Although the computer is not yet a year old, the VIC II chip reportedly is already in its eighth revision.

As noted, these revisions have dramatically improved the video quality on late-model 64s. However, one of the latest revisions to the computer inadvertently made recent 64s incompatible with some existing commercial software. If you loaded a commercial program into a new 64 recently and were surprised by a blank screen, you're probably a victim of this mix-up.

To fully comprehend what happened, let's look briefly at how the 64 displays information on the TV screen. It might seem like heavy going for those of you who are not programmers (or don't want to be), but the concepts are essentially easy to understand.

Picture the screen as a "window" looking onto a section of memory within the computer. This section of memory is called *screen memory*, and any number placed in these memory locations shows up on the TV as a character. "Screen memory" is just like regular memory, except that whatever is stored there will also appear on the screen. It is set aside to "hold" the image. The 64's screen memory consists of 1000 such locations, because in text mode the computer displays 25 horizontal rows of 40 characters (25 x 40 = 1000). In a standard 64, screen memory starts at location 1024 and ends at 2023 (1000 locations, inclusive).

For example, let's say we want to make a tiny white ball character appear in the middle of the screen. We could do this with the PRINT statement in BASIC, but it's also possible to do it another way: by inserting the proper number directly into screen memory. Screen memory starts at the upper left corner at location 1024, so the middle of the screen would be about 1524. First, clear the screen by holding down the SHIFT key and pressing the CLR/HOME key. To make the ball appear, put the *character code* number for a ball at location 1524 by typing POKE 1524,81. Press RETURN. Presto! A tiny white ball appears.

What's that, you say? The ball did not appear? If you're still staring at a blank screen, you've got one of the newer 64s with a revised VIC II chip. If the white ball *did* appear, you have an older 64 with a previous VIC II chip.

And if this little exercise sounds familiar, it's because the same exercise is found on page 64 of your *Commodore 64 User's Guide*. If you tried that exercise when you first brought home your computer and didn't see the white ball, rest assured that *your Commodore 64 is not broken*. The chip revision has made this part of the manual incorrect.

It also made some commercial programs obsolete – those programs which printed characters on the screen by putting numbers directly into screen memory. The result is the same: a blank screen.

The Invisible Characters

Actually, the screen isn't truly "blank." The ball character *is* there, but it's invisible, because it's the same color as the background. Here's why:

Most computers use similar types of screen memory to create their video displays. However, the 64 (and, incidentally, the VIC-20) also use another section of memory for the screen – *color memory* or *color RAM* (Random Access Memory). The 64 has 1000 locations of color memory, one for each screen memory location. Color memory starts at location 55296 and ends at 56295.

Now, this is important: the number stored in color memory determines the color of the character in screen memory.

The older 64s automatically filled all 1000 color memory locations with 1's when the screen was cleared (1 is the color code for white). So, any character placed in screen memory automatically showed up as white.

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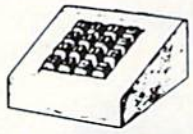

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whatever color code happens to be in the *background color register*. Normally, this is 6, the color code for dark blue. That means any character placed in screen memory also will show up as dark blue – so it won't show up at all. It will blend into the background.

Conclusion: any program that creates screen displays on new 64s by putting numbers into screen memory, *without also putting a contrasting color number into color memory*, will wind up with a "blank" screen.

(To prove that the ball is really on the screen in the above example, repeat the exercise on a new 64 with one additional instruction, POKE 55796,1. Press RETURN. The ball will now appear as white against the dark blue background, because we put the color code for white into the corresponding location in color memory. PRINT statements in BASIC work the same on both old and new 64s, because they automatically take care of such details.)

One of the commercial programs affected by the revision was *WordPro 3+/64*, the word processor by Professional Software, Inc. As soon as Professional Software became aware of the problem, it immediately revised *WordPro* and allowed previous buyers to exchange their disks for new ones. Luckily, *WordPro* had just been released for the 64, so not many original copies were sold. (The revised *WordPro* still works on earlier 64s, too.)

When Commodore learned of the compatibility problem, it sent letters explaining the revision to all the outside software companies developing programs for the 64. If you have some software which seems to suffer from this problem, contact the producer for a revised version.

In some cases, the problem can be fixed by typing FOR X=1 TO 1000:POKE 55295+X,1: NEXT and pressing RETURN before loading or running the program. This fills the color memory with 1's for white.

This revision is a perfect example of how a seemingly minor change in a computer can have widespread consequences. In this case, the revision actually was made to a part of the 64 known as the *kernal*. The kernal is mostly of interest to machine language programmers. It's basically a set of entry points into the 64's BASIC language and *operating system* (the built-in program that performs a computer's routine housekeeping chores).

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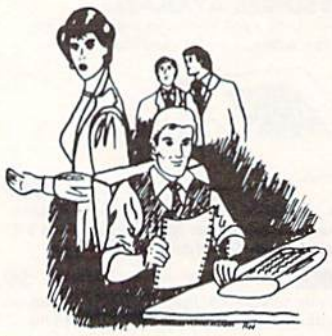

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Commodore Classics

QUICKFIND

Harvey B. Herman, Associate Editor

Since the Commodore PET was introduced in 1977 as one of the first personal computers, hundreds of handy programs and routines have been written in Commodore BASIC. Many of these programs, when translated and updated, are equally handy for users of today's VIC-20 and Commodore 64 computers. From time to time we'll feature some of these "Commodore Classics." This one was adapted from a program and article by Harvey B. Herman, an associate editor of COMPUTE!.

If you use tape, you'll love "Quickfind."

Quickfind lets you locate and load programs off cassette tape in a snap. Although it's still not as good as owning a disk drive, it does remove much of the frustration of storing many programs on tape – and it's a lot less expensive.

Quickfind permits programs to be loaded after the tape has been positioned by Fast Forward *under computer control*. It was originally written for the Commodore PET back in the days before floppy disk drives were available. The Datassette recorders made then did not even have tape counters. Finding programs on a cassette tape was a time-consuming task. Although today's Datassettes have digital tape counters, Quickfind is still a useful utility. It works by storing a directory as the first program on each tape. This directory calculates the proper amount of time to Fast Forward to locate each file. Quickfind is self-prompting and easy to use, even for beginners.

Two updated versions of Quickfind are included here, for the VIC-20 and Commodore 64. Be sure to carefully type the right listing for your computer and read the following instructions.

How To Prepare A Tape

1. Load a copy of Quickfind into the computer and change the program names in line 350 to those of your own programs. A *filename*, as it's called, may be up to 16 characters long (including spaces). *Do not* remove the word DATA from line 350. The first word on this line must be DATA so the computer knows that the subsequent characters are data to be read. A VIC or 64 accepts only 80 characters per program line, so if you run out of room, start a new line 360 with DATA as the first word and continue entering your filenames.

2. At line 140, set the variable N equal to the number of programs you are storing on that side of the cassette (in other words, the number of program names you included in line 350). For instance, if you are recording six programs, change line 140 so N=6. This tells the computer to expect six programs on that side of the tape.

3. Now SAVE your modified version of Quickfind as the first program on a new tape. *Do not rewind*. Remove this tape and insert the cassette from which you want to load your first program.

4. LOAD the program into the computer. Remove the cassette.

5. Insert the Quickfind tape and SAVE the program. It should now be recorded just following the Quickfind program itself on the new tape.

6. Rewind the tape, LOAD and RUN Quickfind. Select the next program and let the computer fast forward to the proper place. *Do not rewind*. Remove the Quickfind cassette, and again, insert the tape from which you want to load the next program.

7. LOAD the next program.

8. Put back the Quickfind tape and SAVE.

9. Repeat steps 6 through 8 as many times as necessary. (This will depend on how many programs you are storing on that side of the cassette.)

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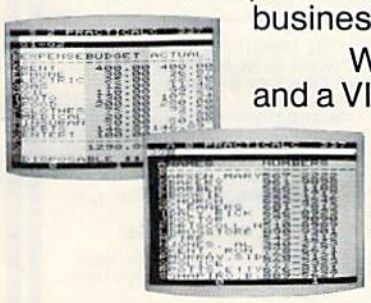

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This procedure is easier than it appears and will become second nature if you do it often.

How Quickfind Works

You can skip this part if you want. You already know everything you need to use Quickfind.

But for those who are interested, Quickfind works because the Commodore Datassette is more sophisticated than it might appear at first glance. The computer can control its drive motor and detect if a switch is pressed. It cannot differentiate, however, between the press of Fast Forward or Play. That's why after running Quickfind and selecting your program, Quickfind prompts you to press the right buttons. Here are the steps in that sequence:

1. Is a button pressed? If yes, prompt for release and wait until no. If no, continue.

2. First program? If yes, skip ahead to step 8. If no, continue.

3. Prompt for press of Fast Forward.

4. Fast Forward pressed? If yes, continue. If no, wait until yes.

5. Turn off Datassette motor when time is up.

6. Prompt for release.

7. Fast Forward released? If yes, continue. If no, wait until yes.

8. LOAD program using "dynamic keyboard" technique.

The programs are spaced six seconds apart in this version of Quickfind (see line 280). Time is kept by the built-in "jiffy clock." (A *jiffy* is a sixtieth of a second.) The variable TI always contains the value of this clock.

"Dynamic keyboard" is a technique for loading programs from within another program. It is similar to the trick the computer uses when you press the SHIFT and RUN/STOP keys and get an automatic LOAD and RUN (see this month's "Gazette Feedback"). If you want Quickfind to do automatic LOADs and RUNs, you can change the 13 in line 340 to a 131.

Don't be discouraged if you fail to understand any or all of the technical details. We were all in that boat at some point. Quickfind can be used even if you don't understand all the tricks. Keep in mind that as you continue to use your VIC or 64, what now seems to be arcane black magic may become clearer to you. At that time you'll be able to refer back to technical discussions for help with your own programs. It may happen sooner than you think.

See program listings on page 114.

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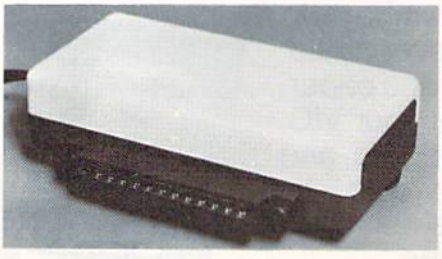

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JIMMY HUEY

The Programmer Behind *Galactic Blitz*, *Sidewinder*, And *Swarm!*

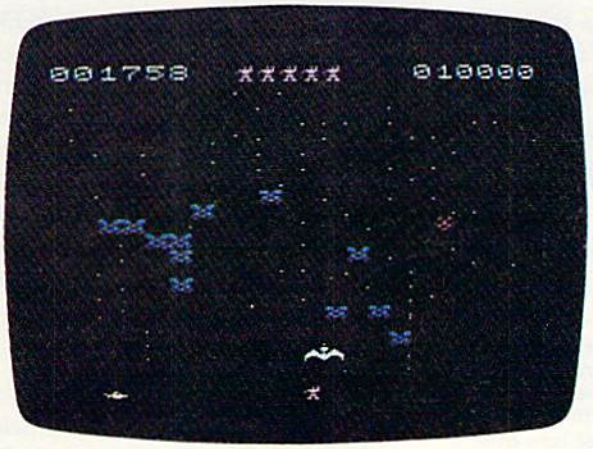
John Blackford, Assistant Features Editor

A good game programmer can squeeze arcade-quality action even from a computer with very limited memory, such as the VIC-20. Quality game programmers are hard to come by and are in increasing demand by software producers. Each month, "Inside View" will highlight some of the best programmers in the field.

Programmer Jimmy Huey is an old-timer at 22 years of age. The other two programmers who work with him at Dragonfly, a small software development firm, are 17 and 18. One of them is still in high school. Often the top people in professional game programming are quite young.

Huey got his start in junior high school in Los Angeles around 1974. "That was a long time ago," he notes. "Back then we didn't have any of those Apples or Commodores. All we had were 100-baud teletypes connected to a Hewlett-Packard computer used by the school administration. We could use it for about an hour a day. Only about two or three people in the whole school were interested in computers then.

"We didn't have any games to speak of – at least no graphics – because the only output from the teletypes was paper." The paper spewed out in a continuous roll, just as it used to from wire-service teletypes in the newsrooms of big-city newspapers.



Galactic Blitz.

Huey has finished four games for the VIC-20 in the year since he started programming seriously. The four – and all other games produced by Dragonfly to date – are marketed by Tronix Publishing, Inc.

The games are fast-paced, machine language programs with smooth, arcade-like action. Three of them – *Sidewinder*, *Galactic Blitz*, and *Swarm!* – are available on cassette, while the fourth (*Scorpion*) is sold as a plug-in cartridge. *Galactic Blitz* and *Swarm!* require no memory expansion, while *Sidewinder* needs an 8K expansion module. *Sidewinder* features horizontal scrolling and several types of aliens, including one that appears suddenly on the screen and homes in rapidly on your rocket-equipped helicopter.

The trick to beating the game, according to Huey, is to keep moving fast. "The game has a time limit," he advises. "If you spend too much time in one place, the aliens will get you. Go forward as fast as possible, then flip back and fire."

The first game Huey wrote for the VIC-20 was *Galactic Blitz*. It features bomb-dropping aliens that swoop around the screen in changing patterns. The aliens consist of a special four-character set that Huey designed.

Huey had just acquired the VIC and wanted to do some machine language programming when he started *Blitz*, but he didn't have a full-featured assembler (software that makes it easier to write a machine language program). All he had was Commodore's mini-assembler, *VICMON*, which doesn't use labels (for variables) or move

blocks of code very easily. Still he created the entire game with it, using only cassette tape as a storage medium.

"I would test a subroutine, then record it on cassette, adding it to the main program," he explains. "Then I'd test the main program. I built up the whole thing little by little.

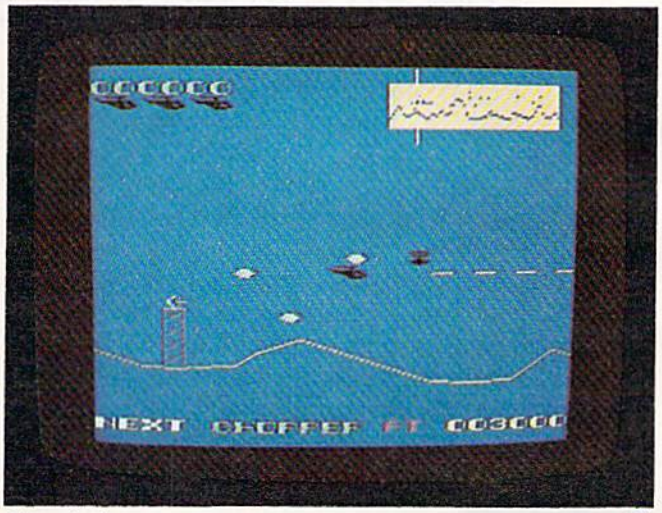
"Working with the mini-assembler, I wasn't sure how much memory I had left. You only have about 3.5K of usable RAM. [The VIC-20 comes with 5K, but some is used for internal housekeeping functions of the computer.] Of course, I knew how many subroutines I'd need, so I allocated a certain number of bytes for each one."

But what would happen if he found out later that a subroutine needed more space than he had allocated? That could cause problems. "You can get kind of lost when you start moving blocks of code, because the jump routines will go to the wrong places. You have to make a lot of changes to make it work."

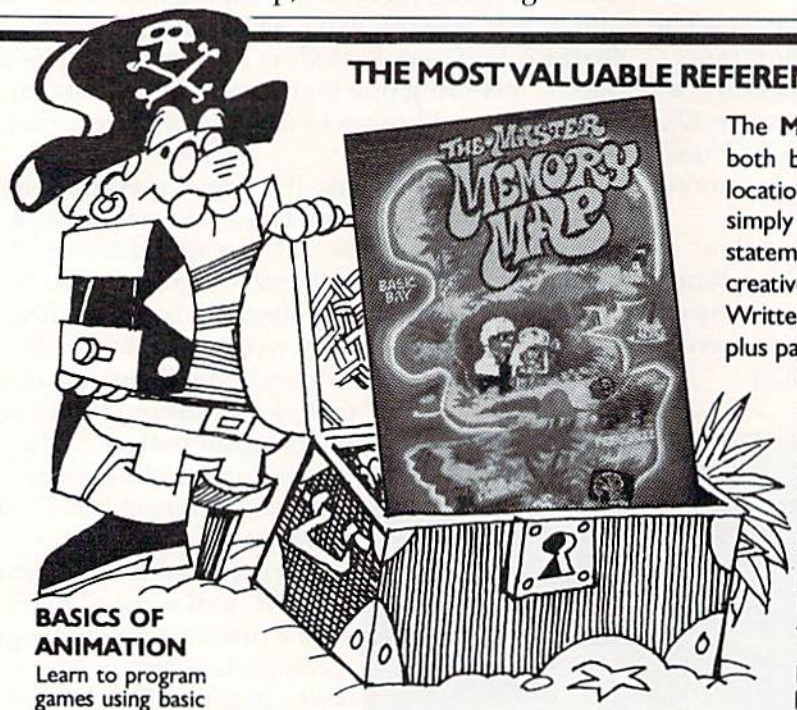
To avoid such trouble, he left code between the subroutines that was essentially free space – it wasn't part of the program, but it didn't interfere with the program, either. Using that method, if he later found that a subroutine required more memory than he'd allowed, he could type over the dummy code, replacing it with the extra part of the subroutine.

"First I did the ship, then the shooting routines for it." Next came the star field that forms the background for *Galactic Blitz*, then the aliens, and finally, the bombs that the aliens drop. "After the main program was finished, I started filling up the spaces made by the dummy code with some of the sound routines."

Since there is no space to spare in the unexpanded VIC, Huey wasn't entirely sure there would be enough memory for the program until it was done – but it ran without difficulty, a testament to both the potential of a modest computer without costly peripherals and to its programmer.



Sidewinder



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SKYDIVER

Alan Crossley

"Skydiver" is an arcade-style game for the unexpanded VIC-20. We've added a version for the Commodore 64, and for the VIC-20 with a Super Expander cartridge. All versions require a joystick.

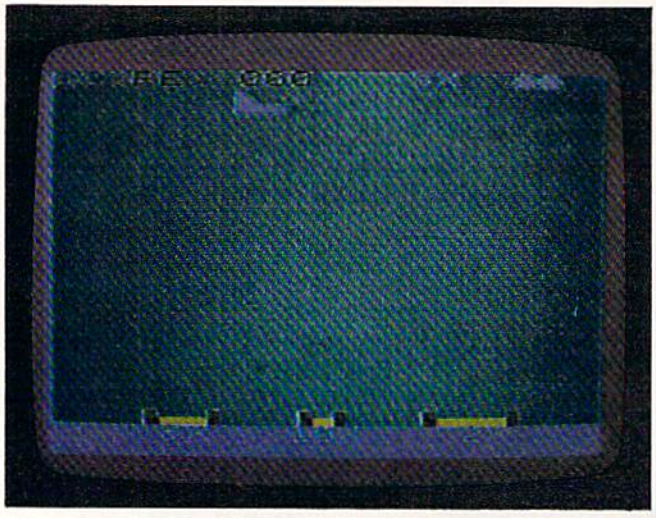
"Skydiver" is a game of skill and luck in which you try to control a parachutist to a safe landing. It's up to you to choose when to jump and which landing pad to try for. You'll also have to learn to compensate for varying winds.

There are three landing pads to choose from – labeled 2X, 5X, and 10X. Each pad is more difficult to land on than the previous one, and therefore scores more points (2X is the largest pad, 10X the smallest). If you land successfully, you are rewarded with a tune and bonus points. If you miss, you lose one of your three skydivers. At 5000 points you are awarded an extra skydiver. Each time you make two successful landings, the game's difficulty level increases and the bonus value goes up 50 points.

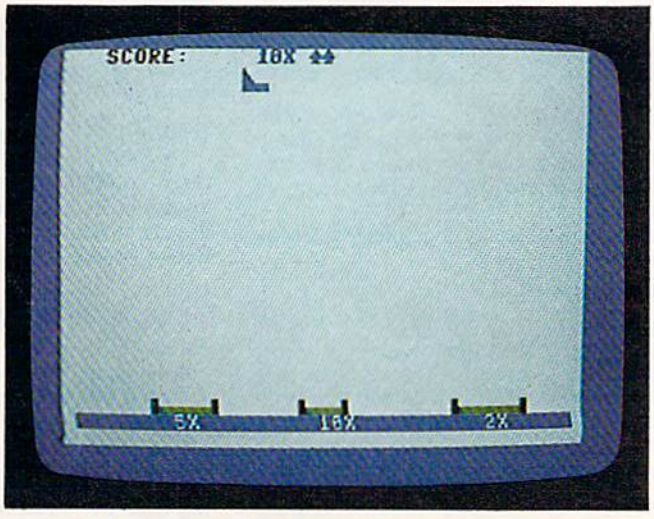
To play, press the joystick button to clear the title screen. Next, choose which landing pad to try for by manipulating the joystick to indicate your selection. If you don't choose before the countdown timer expires, the computer will choose for you. Pressing the joystick button chooses the landing pad you want and starts the game.

Watch carefully as the airplane emerges from the left side of the screen. Gauge the distance to the landing pad you want to try for – taking into account the wind – and press the joystick button to jump. Your skydiver will leap into a freefall. The parachute will deploy about halfway down, and the joystick will control the remaining descent.

See program listings on page 115.



The airplane, bearing a parachutist, flies over the targets in the VIC-20 version of "Skydiver."



"Skydiver," Commodore 64 version.

SNAKE ESCAPE

Action Game For VIC-20 And 64

Daryl Biberdorf

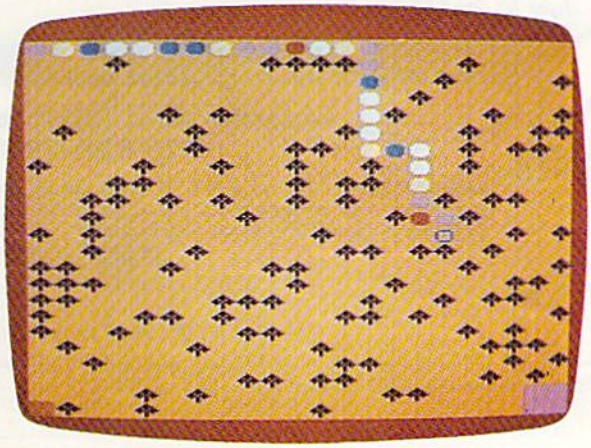
In "Snake Escape," your goal is to move a snake out of a poisonous garden. There are approximately 150 poisonous plants on the screen after you enter your skill level. The snake appears in the upper-left corner after all poisonous plants have been placed. You then attempt to get the snake to the escape hole within the time limit you chose earlier.

The snake must reach the hole without hitting a poisonous plant, running into itself, or running out of time. If it reaches the escape hole safely, you will receive a bonus in addition to your score. The snake grows as it moves along; you receive one point for each body segment it adds while moving. If it runs into itself or a poisonous plant, a cross will appear in the center of the screen with your score and the number of remaining snakes. You may stop the snake if you wish by simply releasing all keys, but remember this costs you time.

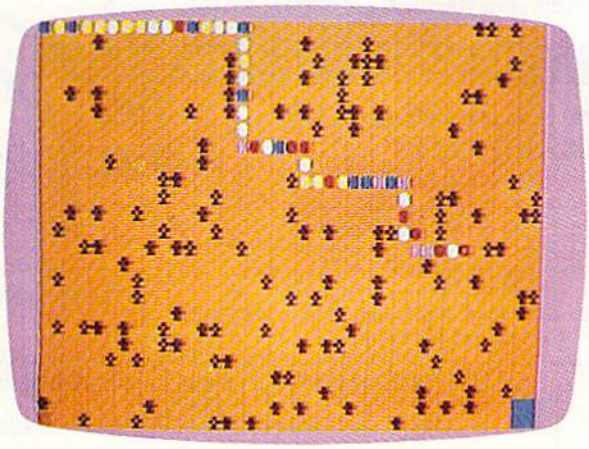
Strategy

If you are running your snake near the left or right edges of the screen, remember that both the VIC and 64 have horizontal screen wraparound. You may end up hitting a poisonous plant on the other side of the screen, so be careful! Occasionally, the snake will be cornered between plants and itself due to a miscalculation in maneuvering. Try to fill up all the spaces you can in the cornered-off area. You may lose a snake, but you will still receive a few extra points. Also, try to keep moving at all times. And watch where you're going!

The direction the snake moves is determined in lines 200 through 230 in both versions. As written, keys I (up), J (left), K (right), and M (down) move the snake. If you aren't comfortable controlling the snake with these keys, you can easily change the program to accept other key commands.



The multicolored snake winds its way through the poisonous mushrooms toward the goal in "Snake Escape," VIC-20 version.



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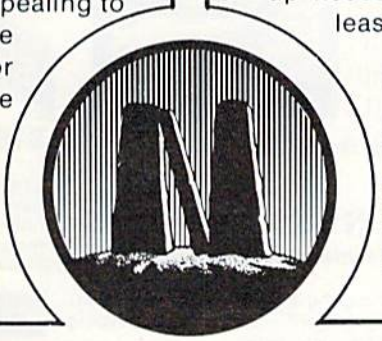

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```
1 PRINT PEEK (197):FOR I=1 TO 400:NEXT I:
  GOTO 1
```

and then RUN the program. Next press the Z key, and the number in location 197 corresponding to the Z key will print repeatedly on the screen. The VIC will print 33, the 64 will show 12. Try some other keys, noting their values, then hit the RUN/STOP key.

You are now ready to make the modification in line 200. In the VIC version, replace 20 with 33, and in the 64 version, substitute 12 for 34. RUN the program (after deleting line 1, of course); you can move the snake left with the Z key.

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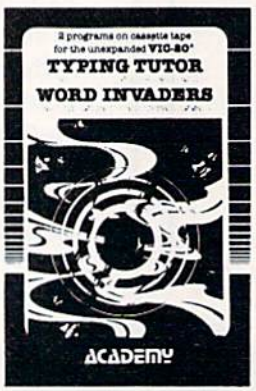

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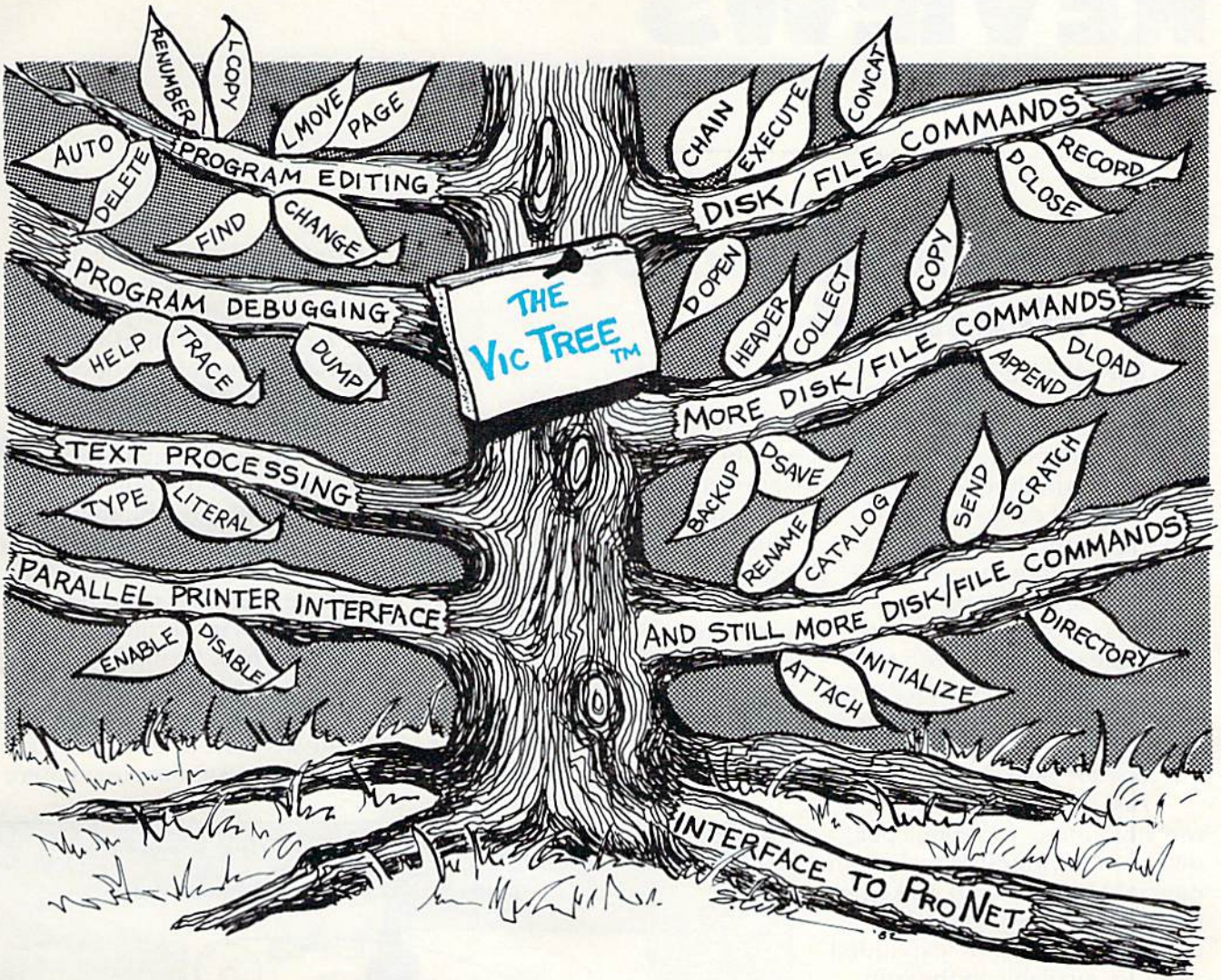

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REVIEWS

Exatron Stringy Floppy For VIC-20 And 64

Tom R. Halfhill, Editor

One of the most common dilemmas faced by home computer owners is whether to invest several hundred dollars in a disk drive or to stick with cassette tapes for storing programs.

A lot of trade-offs are involved: cassette recorders are much cheaper (under $75 for a Commodore Datassette), generally reliable, and the cassettes themselves are fairly rugged. But they are also slow.

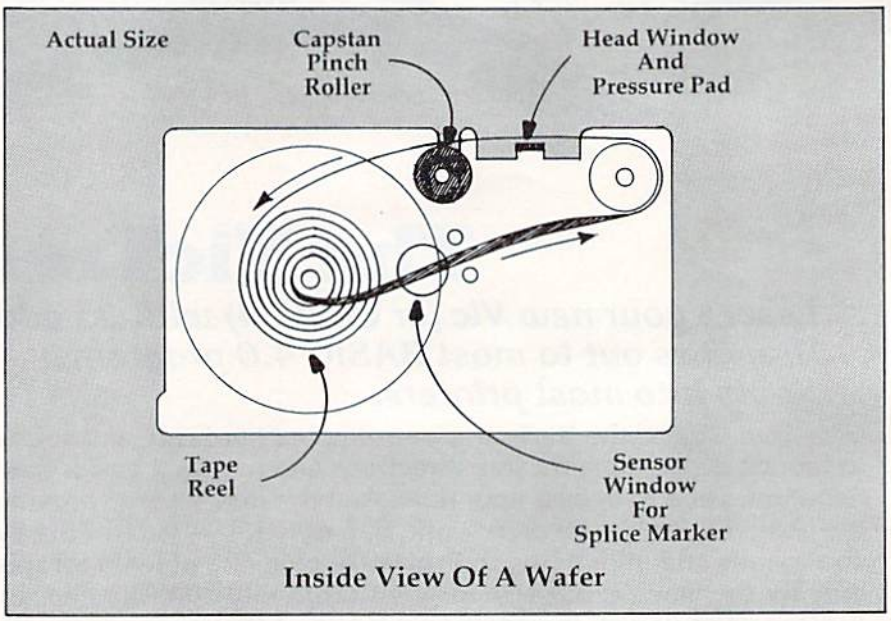
Disk drives are very fast, can store many programs per disk, run a wider variety of commercial software, and make possible certain advanced techniques with the new "expanded" memory available to the computer. But they are also expensive ($375 and up).

Some people have sought alternatives to both storage methods, turning to add-on devices which speed up cassette recorders, among other things. The newest alternative for VIC-20 and Commodore 64 users is the Exatron Stringy Floppy.

The Exatron Stringy Floppy isn't really new; it's been widely used since 1978, mostly by owners of Radio Shack TRS-80 computers. It was only recently made available for the VIC-20 and 64. At $199.50, it could be an attractive alternative to a disk drive.

The Idea Behind Stringy Floppies

Exactly what is a Stringy Floppy? It's a mass storage device that's sort of halfway between a cassette recorder and a disk drive, although it has more in common with recorders. In some cases, a Stringy Floppy is faster than a disk drive, although in other cases it can be as slow as a cassette. For media, Stringy Floppies use a small tape cartridge called a *wafer*. Wafers are extremely small and light – about two-thirds the size of a credit card and about three credit cards thick. Inside the wafer cartridge is digital-quality magnetic tape only 1/16-inch wide.



Inside View Of A Wafer

The tape in a wafer is wound differently than tape in a regular cassette. Cassette tape is wound end-to-end on spools, and the cassette must be flipped over or rewound for repeated use. But the tape in a wafer is one long continuous loop, very much like the tape in audio eight-track cartridges. A wafer is never flipped over or rewound. It winds in one direction only.

Because Stringy Floppies use tape, even though it is wound continuously, they share one important characteristic with conventional cassette recorders: they are *sequential access* devices. This point is important because it dictates how Stringy Floppies must operate. A sequential access device stores programs sequentially, one after the other. To get to a program somewhere in the middle of the tape, it must first wind past all the intervening tape. On the other hand, a disk drive is a *random access* device. The movable read/write head in a disk drive finds a program in the middle of a disk and moves to it directly.

A good analogy is to think

of stereo systems. To play a song in the middle of a cassette tape, you first must press Fast Forward and wind past all the preceding songs. But to play a song in the middle of a record, you need only lift the tone arm to the proper band; the preceding songs are bypassed. Disk drives work on the same principle.

Stringy Floppies, however, record programs and data sequentially, beginning at the start of the tape loop and continuing until the end. The Stringy Floppy drive is an "intelligent" peripheral device, and it knows where this tape loop begins and ends. This is accomplished with a shiny metal marker that splices the tape loop together. On top of the wafer is a small circular window, and a sensor within the Stringy Floppy drive peers through this window to detect the marker as the tape winds by.

Usually Far Faster Than Tape

Wafer tape winds very fast – eight inches per second (conventional cassette recorders wind tape at only 1⅞-inches per second). It transfers data quickly, too. That's why, under ideal conditions, a Stringy Floppy can outperform a VIC-1540/1541 disk drive (which admittedly is a bit slower than some other disk drives). However, because the Stringy Floppy is inherently a sequential access device, it can be as slow as a cassette recorder for some operations. In the vast majority of cases, though, it will prove much faster than cassettes.

The amount of data that can be stored on a wafer depends on the length of its tape loop. Wafers

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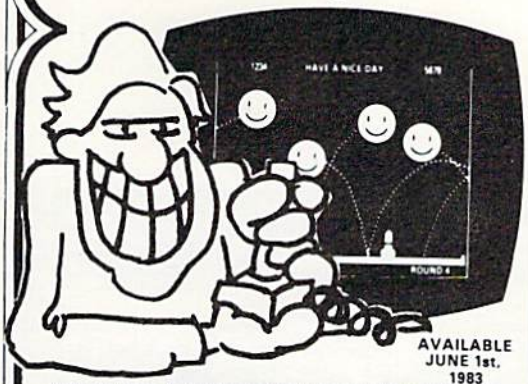

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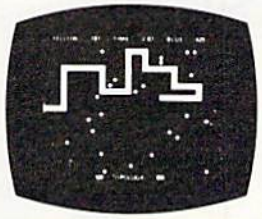

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The Exatron Stringy Floppy, with a wafer inserted in the front slot.

are available from Exatron in lengths of 5, 10, 20, 35, and 50 feet. The shortest wafer holds 4000 bytes (4K), which is enough to store the longest program possible in an unexpanded VIC-20 (which has 3583 bytes free for programming). The longest wafer holds 40K, which is enough to store the longest program possible in a 64 (which has 38911 bytes free for BASIC).

Speed Vs. Economy

The Exatron Stringy Floppy drive itself is a light, compact unit about a third the size of a VIC-1540/1541 disk drive. Hooking it up is simple – just plug in two cords. The first one, a coiled cord, plugs into the same input/output port on the back of a VIC or 64 that is used by the disk drive. (If your system already includes a disk drive, the Stringy Floppy plugs into the back of the drive, forming what is called a *daisy chain*.)

The second cord is for power – unlike the Datassette, the Stringy Floppy does not draw its power from the computer. The power cord has a transformer that plugs into the wall socket.

There are no switches, buttons, or controls of any kind on the Stringy Floppy. It comes on when it's plugged in, and one of the two red lights on the front panel lights up briefly to let you know. It blinks again when the computer is switched on. You'll hear a quiet whir as the Stringy Floppy initializes itself. The next step is to insert a wafer by sliding it, topside-up, into the front slot until it snaps into place.

The Stringy Floppy's commands are straightforward, and are similar to the standard VIC/64 commands for saving, loading, and verifying programs and data. The main difference is that the Stringy Floppy is addressed as device number 20, so a comma and 20 must be tacked onto each command. The 27-page manual explains all of this in a step-by-step, easily understood manner, with examples.

For instance, calling up a directory for a wafer is very much like the procedure on a disk drive. You type LOAD"$",20 and press RETURN. When the directory is loaded, you read it by typing LIST. This shows all the files stored on that wafer. Of course, since the directory itself is loaded as if it were a file, it erases any program currently in memory.

To load a file, you type LOAD"filename",20. The Stringy Floppy's second LED, a busy light, blinks on as the unit speeds through the wafer in search of that file. The drive searches sequentially through the tape, pausing briefly at the start of each file to check if it's the right one. When it finds its target, it loads the file in a matter of seconds (often faster than a disk drive).

But the key factor here is the search time. Remember, the Stringy Floppy cannot rewind its tape – it must always search forward through the tape loop. Although the unit loads files very quickly once they are found, the search time depends on where the tape happens to be positioned. Under ideal conditions, when the tape is positioned just before the file you want, the whole loading procedure takes only a few seconds. The extreme case is when the tape is positioned just *after* the file you want. Then the Stringy Floppy must search the entire length of the tape loop. This happens every time you VERIFY a previous SAVE, and every time you call up a directory. Since the Stringy does not store its directory in one place, as a disk drive does, it must search the entire wafer for the filename headers which precede each file.

The time consumed by these

searches depends, of course, on the length of the wafer. On a medium-length wafer (20 feet, or 16K), one complete cycle through the tape loop takes 55 to 65 seconds (the exact time depends on the number of files stored, since the Stringy pauses briefly to read each file header). So when you SAVE a short program on a long wafer, the VERIFY procedure could take as long as rewinding a conventional cassette and then VERIFYing.

Thus, it seems shorter wafers would be the answer. But there's a trade-off involved – there's not much difference in price between the shortest and longest wafers. The lowest price for a five-foot, 4K wafer is $2.50, while a 50-foot, 40K wafer is $3.50. Since wafers always store data in 1K blocks, no matter how short the actual program is, a 4K wafer is pretty much limited to one or two short files. This makes short wafers significantly more expensive than disks or cassettes. Long wafers are a much better bargain, but also require much longer search times.

So, the trade-off is between the convenience and speed of short wafers versus the economy of long wafers.

Keeping Track Of Files

Another factor to consider when weighing the merits of a Stringy Floppy is the convenience of storing multiple files on a single wafer. Disk drives, of course, automatically keep track of where files are stored. With cassettes, you have to manually keep track of what files are on which tapes, usually by jotting

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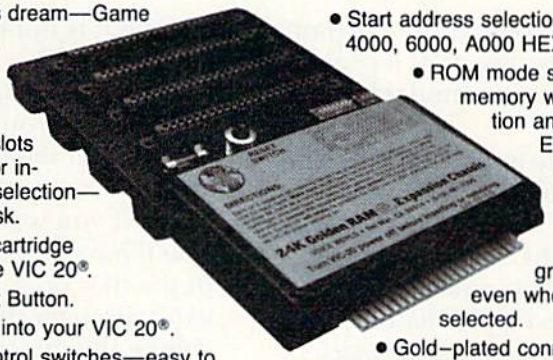

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down the tape counter numbers. With a Stringy, you'll probably have to keep a similar log. Here's why:

There are two SAVE commands for the Stringy. The first is SAVE"filename",20 (filenames up to eight characters are allowed). This automatically stores the file as *the first file on the tape loop following the splice marker.* The Stringy does not check to see if a file is already there, so one or more files can be overwritten if you use this command carelessly. (However, the Stringy *does* check to see if the end of the tape loop has been reached – if so, it will stop recording, and your subsequent VERIFY will tell you that the SAVE was interrupted.)

The second command is SAVE"#filenam",20 (only seven-character filenames are allowed because of the # sign). The # sign, which is stripped off the filename by the Stringy, tells the Stringy to store the file *wherever the tape is currently positioned.* Important: It's up to you to insure the tape is positioned after the end of the last file on the wafer. Otherwise, existing files may be overwritten.

Unfortunately, there is no special command to position the tape past the last file. The best way is to VERIFY the last file. Since the last file will be different than the file you want to save, a ?VERIFY ERROR will result. This is just what you want; the tape is now properly positioned for a SAVE with the # sign. Then you VERIFY with the proper filename to double-check the SAVE. This is the procedure recommended by Exatron, although it is not mentioned in the manual.

This whole procedure also depends on your knowing the filename of the last file; otherwise, you can't get the ?VERIFY ERROR you want. That's why you'll have to keep a careful log of the files on each wafer. You can't discover the filename by calling the directory, because loading the directory will erase the file in memory that you want to save (as it does on the disk drive).

Does all this sound confusing? Exatron advises new users of Stringy Floppies to store only one file per wafer until they get the hang of it.

Other Considerations

As a general-purpose mass storage device, the Stringy Floppy supports the same commands as the Datassette and disk drive, including OPEN, PRINT#, INPUT#, GET#, CLOSE, CMD, and STATUS. This means you can store data files on wafers in addition to programs, perform input/output during program execution, and so on. The Exatron manual explains these operations.

Exatron warrants the Stringy Floppy for one year, parts and labor, and offers a 30-day money-back guarantee of satisfaction. Unlike a disk drive, the Stringy does not have a movable read/write head, and the only moving parts are the tape transport mechanisms, so it should be a reliable device. The only maintenance it requires is an occasional head and capstan cleaning.

Besides convenience and cost, another major factor to consider is commercial software availability. Software is widely available on cassettes and disks, but this is not yet the case with wafers. That might well change soon, however, if Stringy Floppies become a popular alternative for VIC and 64 users. In the TRS-80 community, some software has been made available on wafers. Also, Exatron is trying to collect public domain software for VICs and 64s to distribute free with sales of blank wafers.

New Momentum

There's evidence that Stringy Floppies are picking up momentum among other computer users, too. A new line of peripherals introduced by Texas Instruments for its new $99 TI-99/2 computer includes a Wafertape drive, which is an Exatron Stringy Floppy licensed to TI. The Wafertape drive also works on TI's new Compact Computer 40 and – with an adapter – on the TI-99/4A. A recently announced portable business computer also has a Stringy Floppy for mass storage. The Stringy's small size, speed, and ruggedness make it ideal for portables.

Whether you go with a cassette, disk drive, or Stringy Floppy, remember that the mass storage device is probably the most important peripheral you'll buy. All have advantages and disadvantages; which one is "best" depends mostly on your needs. Exatron's Stringy Floppy is clearly a viable alternative.

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Deadly Duck Cartridge Game For Unexpanded VIC-20

Tom R. Halfhill, Editor

For a while, most of the best computer games were available only for such machines as the Apple II or Atari 400/800. Partly this was for marketing reasons: these computers have what's called a large "installed base," and the major software companies naturally preferred to make games which would sell to the most customers.

But that's been changing now that the VIC-20 and Commodore 64 computers have been selling like hotdogs at the World Series. The major software houses are recognizing that a significant new market is developing. Companies once known primarily for their Apple or Atari games are moving to support Commodore, too.

One of these companies is Sirius Software, Inc. Sirius may be a new name to Commodore users, but it's well-known among Apple and Atari game-players for such classics as *Space Eggs* and *Sneakers*. It was also the stomping ground of such famous game programmers as Nasir Gebelli.

Deadly Duck is one of a new line of games introduced by Sirius for the VIC-20 and Commodore 64. Although *Deadly Duck* is available only for the VIC-20 at present, a Commodore 64 version is in the works (in fact, the game instructions refer to the 64 version).

Deadly Duck maintains the standards set by Sirius's previous products: the game program is fast (all machine language) and bug-free, makes excellent use of the computer's color graphics and sound, includes multiple difficulty levels and other options, and is supported by solid documentation. The game was designed by Ed Hodapp and programmed for the VIC-20 by Jeremy A. Jones.

Big Duck In A Small Pond

Although the title *Deadly Duck* might imply that your enemy is some sort of fearsome waterfowl, *you* are actually "Deadly" the Duck. Using either a joystick or the keyboard, you control a multicolored duck which can swim back and forth on a pond along the bottom of the screen. You begin the game with a supply of four ducks; your three spares are displayed below the pond. You can acquire any number of bonus ducks throughout the game, but no more than three of these spares are displayed at a time.

The object of *Deadly Duck* is to retain control of your pond while battling pesty enemies. During the first level, the enemies consist of flying crabs which try to drop bricks on your head. More enemies appear in the higher levels.

Besides evasive action (swimming back and forth), you have another way of defending yourself. Woe unto the unsuspecting hunter who tries to bag Deadly, because this is one duck who is literally armed to the teeth – or bill. Inside Deadly's bill is a hidden gun which fires "bill bullets." You can fire one bill bullet at a time by pressing the joystick fire button (or space bar). Each shot is accompanied by a very realistic "quack."

To aim your shots, you maneuver Deadly directly beneath your target. Naturally, this exposes him to the falling bricks. This means you have to become adept at swimming beneath the flying crabs (which are constantly changing direction), fir-

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ing a quick bill bullet, and then dodging the falling bricks. When a brick misses Deadly and hits the pond, it floats on the water for a few seconds, blocking Deadly from swimming past it. If several bricks fall at once, he can be trapped between them, or against one side of the screen, which makes you even more vulnerable to the falling bricks.

One solution is to shoot the bricks. You also score more points this way, but it's a hazardous tactic since Deadly must be positioned directly beneath them. And in the higher levels, the bricks drop much faster.

More Formidable Foes

To advance to each succeeding level, you must destroy all eight flying crabs. This wins you a bonus duck. Getting past the first level isn't too difficult after a few tries. Beginning with the second level, though, you encounter even more formidable foes. These are the constantly increasing, hovering dragonflies.

Two of these dragonflies appear in the second level. They hover just over Deadly's head, below the crabs. Since they don't move very fast, they're quite easy to shoot, and each hit is worth ten points. Unfortunately, shooting a dragonfly doesn't make it disappear, because the dragonflies are invulnerable. What's worse, shooting the dragonflies only angers them, and they retaliate by dropping bombs on Deadly. Each bomb consists of a slowly descending cloud of tiny fragments. The slightest touch of one of these

"Deadly" the duck swims between two floating bricks while evading the flying crabs and hovering dragonflies.

fragments is deadly to Deadly.

The bombs are relatively easy to dodge in the second level, since there are only two dragonflies dropping only one bomb at a time.

If you survive long enough to reach the fifth level, the bricks start falling faster. And in the sixth level, the crabs start flying as fast as mosquitoes around a light bulb. The crabs are always worth 30 points, and the dragonflies ten points, but you do get more points for shooting bricks in the higher levels – up to ten times the 50 points that bricks are worth in level one.

Attention To Detail

All of the animation in *Deadly Duck* is extremely smooth and swift. You don't expect slow, jerky motion in a good commercial game program, and none is evident here. What's more, all of the main characters – Deadly the Duck, the flying crabs, and the dragonflies – are finely detailed and multicolored. This is especially impressive since the VIC does not support sprites or bit-mapped graphics modes.

Deadly Duck also has several convenience features which should perhaps be standard on all games of this type. The keyboard control option will be appreciated by people without a joystick, or by those who prefer the feel of "buttons" for this game. The f5 function key allows more advanced players to skip the lower levels and begin immediately at the higher levels. The RESTORE key ends any game in progress and returns you to the "demo mode," in which the high score is displayed and the screen colors cycle endlessly. The RUN/STOP key instantly freezes the action in case the phone rings or some other momentary distraction arises. Pressing RUN/STOP restarts the game where you left off. And finally, the f7 function key helps clear up fuzzy images on some color TV sets which are slightly out of synchronization with the VIC's video signal.

The thoughtful design of this product extends even to its plug-in cartridge. The decision to put the game on a cartridge makes it convenient to load and accessible to any VIC owner. *Deadly Duck* is enclosed in a sturdy plastic case with indented and ridged finger-grips. If you've ever struggled to extract a reluctant cartridge from the back of your VIC, you'll appreciate this.

For fans of arcade-style action games, *Deadly Duck* should be a welcome addition to the growing selection of VIC-20 software.

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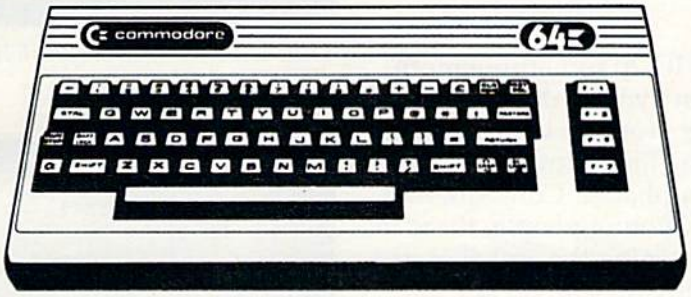

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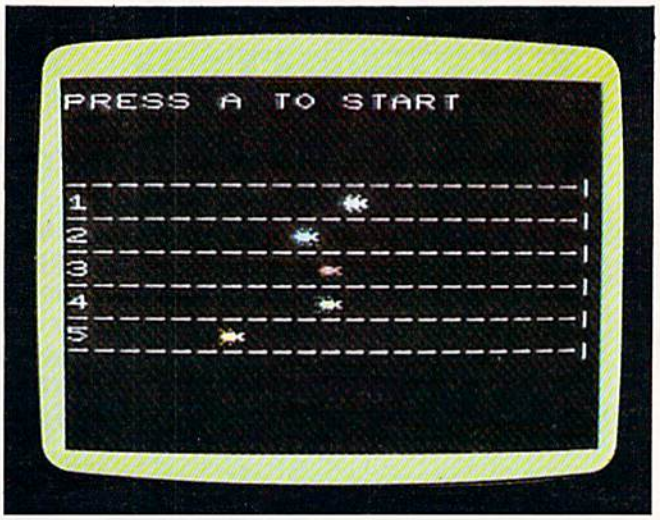
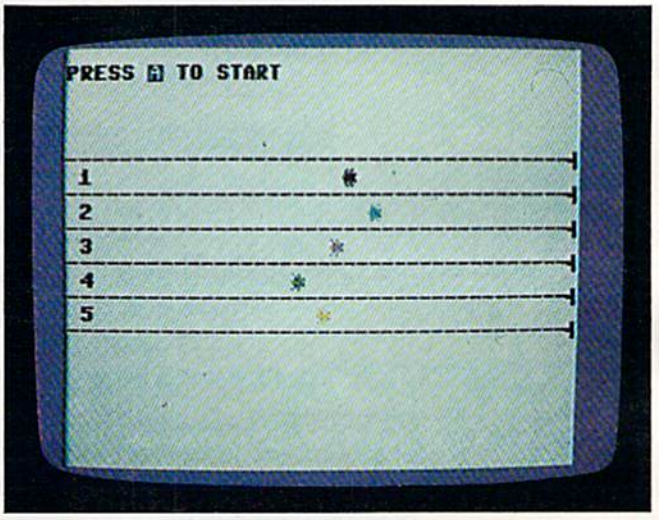
ALFABUG

Michael Wasilenko

"Alfabug" is a colorful, exciting game that helps your three- to six-year olds learn the alphabet. The program was originally written for the unexpanded (5K) VIC-20, and there's also a version for the Commodore 64.



Little critters race to the finish line in "Alfabug," VIC-20 version.



"Alfabug," Commodore 64 version.

In an effort to make my VIC-20 something more than just a keyboard for my young daughters to bang on, I wrote this little program to make it do something and at the same time provide an opportunity to practice the alphabet. Consequently, "Alfabug" is for relatively young people, three to six years old. To a child learning the alphabet, the accomplishment of pressing the correct key to initiate a bug race is quite exhilarating.

The object of the game is to press the same letter of the alphabet on the keyboard that the computer displays on the screen. When the correct letter is pressed, a bug race starts – five different-colored bugs race across the screen. If the wrong letter is pressed, the computer responds with a toot and then waits for the correct letter. The order in which the bugs finish is marked at the end of each lane, so the player(s) can also compete for points by guessing the winner. Upon completion of each race, the player is asked if another race is desired. At this point, a "Y" or "N" for "yes" or "no" is expected. Again, a toot is heard when an invalid answer is given.

In the following program, the computer will select the letters alphabetically beginning with "A" (of course), and will reset to "A" after "Z" is reached. By simply deleting the remark statement (REM) from line 76, the program will select the letters randomly. You could also modify the program so it asks the player for the method of letter selection. But I have found that the fewer the prompts, the easier it is for the child. Remember, this is for young children who are just learning their alphabet or who are just learning to read. For instance, with the selection method fixed in the code, my five-year-old daughter can load and run the program without any assistance.

This simple program can provide hours of fun for young children while helping them practice the alphabet. But watch out! You may not get to use your computer again, unless they're all asleep.

See program listing on page 120.

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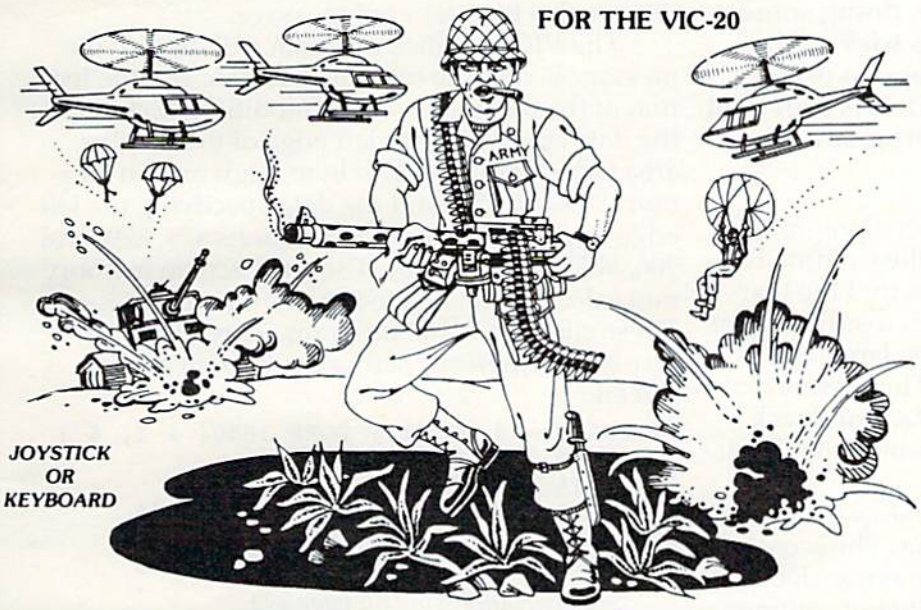

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VIC Marquee

Louis Mendelsohn

With this program, you can display a moving message across the top or bottom of your VIC screen while another program is doing something else. Although it does this trick with machine language, you don't need to understand machine language to use it. It is provided in the form of a BASIC loader program.

"VIC Marquee" is a modification of a program for generating moving marquees on the Commodore PET. The beauty of this program is that the marquee, a moving billboard display across the top of the screen, is generated in machine language as part of the screen interrupt task. This means that the marquees are created as a background task while the primary (BASIC) program can be doing something else.

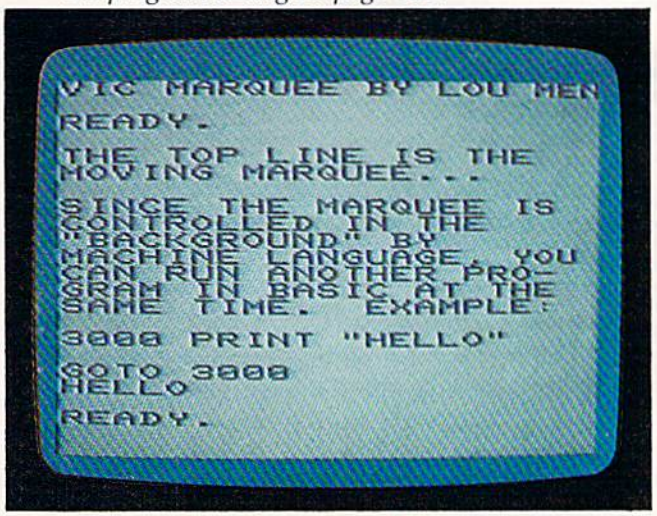
Many modifications to the original program were required for VIC-20 operation. The screen edge location had to be moved to memory location $1E00 (hexadecimal) and the number of columns changed from 40 to 22. In addition, the hardware interrupt vector, IRQVEC, had to be changed from $0090 to $0314, while the interrupt handler, OLDIRQ, was relocated from $7003 to the VIC KERNAL location $EABF. The speed was slowed from 5 to 15 to allow for easier reading. The modified program was kept in the original PET cassette buffer (locations 864 through 1015) since it coincides with the VIC buffer. But the sample message was moved to 830. The message is stored in ASCII code and terminated with a CHR$(0). The high byte and low byte defining the start of the message, stored in locations 1009 and 1011, were adjusted accordingly.

One final modification must be made in using the VIC Marquee, since the technique employed will produce white letters on the normally white VIC screen. Either the screen color can be changed or colored messages can be produced. The program provides a BASIC loader for the VIC Marquee with a blue-lettered message.

The VIC Marquee program will display the message across the top of the screen. But the location of the message is easily modified by changing the data specifying the left edge of the display area (which is stored low byte, high byte in locations 875 and 876) and the data specifying the left edge minus one (stored in locations 878, 879, and 906, 907, and 915, 916). The color screen memory must also be adjusted to provide a visible message. These changes to the program are required to display the message across the bottom of the screen:

```
11 FOR I = 0 TO 21 : POKE 38884 + I, 6 :
    NEXT I
870 DATA 15, 22, 160, 1, 185, 228
876 DATA 31, 153, 227, 31, 200, 204
906 DATA 227, 31, 96, 172, 96, 3
912 DATA 169, 32, 153, 227, 31, 238
```

See program listing on page 121.


VIC MARQUEE BY LOU MEN
READY.
THE TOP LINE IS THE MOVING MARQUEE...
SINCE THE MARQUEE IS CONTROLLED IN THE "BACKGROUND" BY MACHINE LANGUAGE, YOU CAN RUN ANOTHER PROGRAM IN BASIC AT THE SAME TIME. EXAMPLE:
3000 PRINT "HELLO"
GOTO 3000
HELLO
READY.

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Word Hunt

A Puzzle Game For VIC-20 And 64

Eric Jansing and Bob Meyers, Jr.

This VIC-20 translation of a popular Commodore PET program shows how screen compatibility problems can be overcome. It requires an 8K memory expansion. We've also added a version for the Commodore 64.

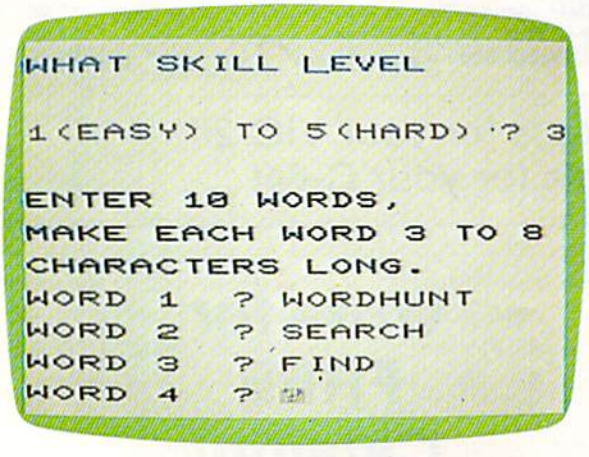
"Word Hunt" is a great game that appeared in the March 1982 issue of **COMPUTE!**, the *Gazette*'s companion magazine. The game was written perfectly except for one thing – it couldn't be RUN on a VIC without some problems. I put the game on the PET and liked it so much that I decided to translate it for the VIC.

After days of problems, I was ready to give up completely until I met Bob Meyers. He too had a VIC. I told him about the game and he agreed that it would be a good project. Bob's solution was to use a VIC 8K expander.

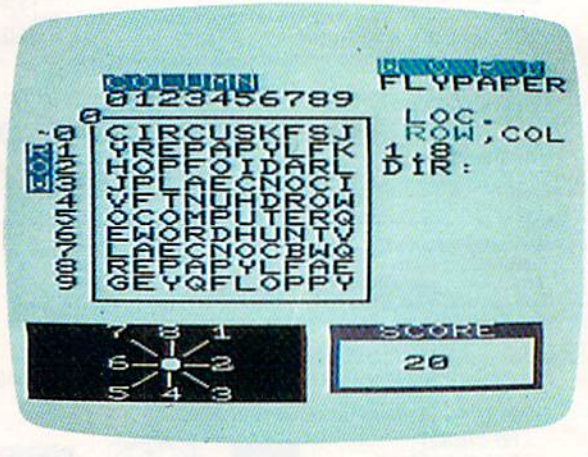
Screen Compatibility

The expander gave us enough memory, but it didn't solve the screen compatibility problem. The original program was written for a 40-column screen; VIC's screen is 22 columns wide. In the end, we took out a few words and abbreviated some others to make the program compatible with the VIC's screen.

In the original program, the puzzle was placed on the screen by a subroutine (line 1700). The variable G determined where the puzzle board was


WHAT SKILL LEVEL
1 (EASY) TO 5 (HARD) ? 3
ENTER 10 WORDS,
MAKE EACH WORD 3 TO 8
CHARACTERS LONG.
WORD 1 ? WORDHUNT
WORD 2 ? SEARCH
WORD 3 ? FIND
WORD 4 ?

The first step in "Word Hunt" is to enter ten words for the puzzle. The Commodore 64 version is similar to this VIC-20 screen.



Hunting for the word "flypaper," VIC-20 version. The next entry would be "6" to indicate the word is spelled backwards in row 1, column 8.

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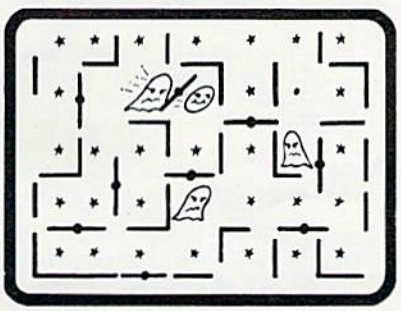

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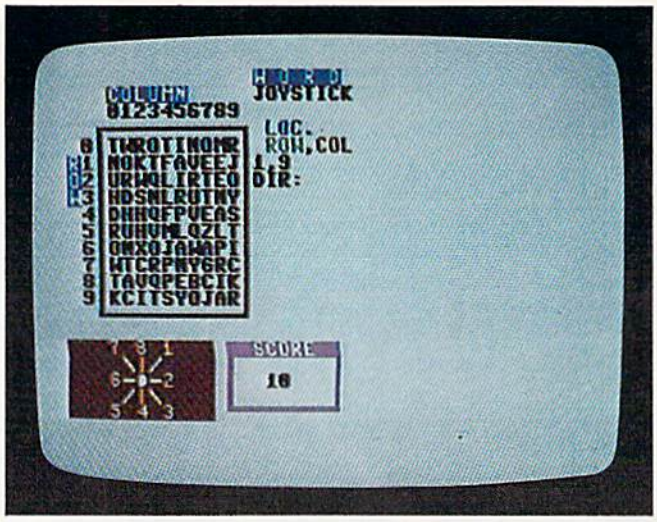

Hunting for the word "joystick," 64 version. The next entry would be "4" to indicate the word runs downward from row 1, column 9.

located. That is mainly what is changed. Also, in line 260 of the original program, the FOR-NEXT statement caused the variable Q to overflow. It now reads: 260 X 9=0: FOR Y=1 TO X.

When you RUN Word Hunt, you get a catchy title with lots of color. The computer then asks you the skill level, 1 being easy and 5 being hard. Then the computer asks you to input ten words. When the computer finishes the puzzle, you're asked to press any key and the game begins.

The computer writes the puzzle on the screen and displays the word you must hunt for. Then you are asked the starting location of the word (ROW,COLUMN), and the computer will ask you the direction. The direction box is located at the bottom left of the screen. To answer the direction, just look at the word and match its direction at the bottom.

If you are correct, the computer will respond "yes" and give you points. The number of points you get is determined by the time you took to answer.

See program listings on page 122.

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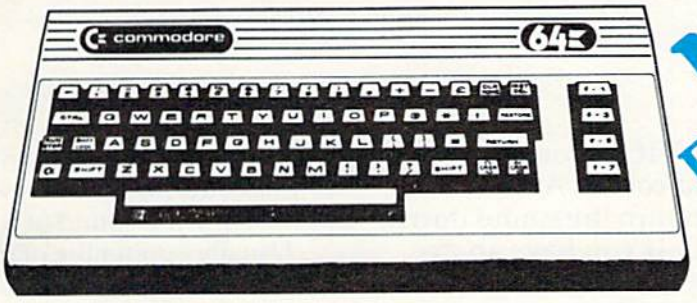

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VIC Timepiece

Joseph D. Wright

With this program, your VIC becomes a clock complete with sound and colors. And, when you prefer quiet, you can turn the sound down. For the unexpanded VIC. If you have an expanded VIC, unplug the memory cartridge before loading and running the program.

What do you do with your computer when you're not using it? Why not let it display the time and show off some of its talents during your "downtime."

This program was fashioned after the plastic rolling-ball clocks. But with this clock, you can turn the sound down when you sleep or watch TV.

Patterns, Sound, Colors

The first step in designing the clock was to lay out different patterns on the screen until a feasible design was found. The next step was to draw the screen display on graph paper (5 x 5 Quadrille), making it easier to list all screen coordinates to which the ball could move.

The screen locations were put in an array, A(40), in the order they would be encountered: from the lower right of the screen, up the "elevator," and across the top ramp to where the ball falls to the second ramp and continues to the position where the first ball might be located. Another array, B(48), shows the route all extra balls take to the bottom of the screen.

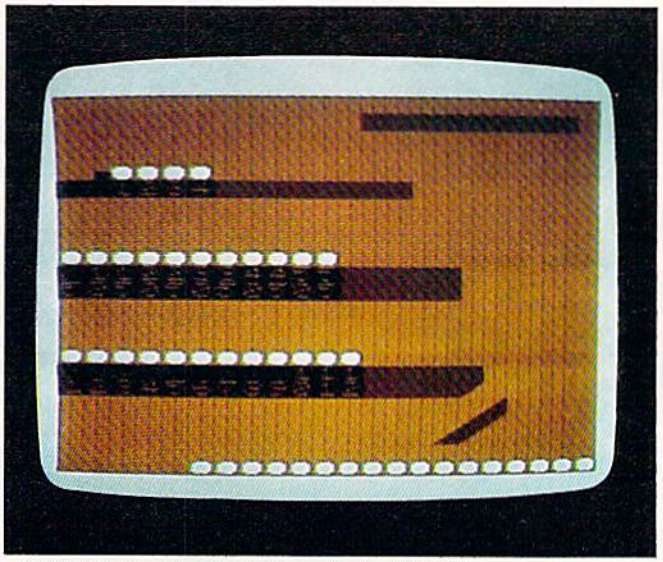
A delay was added to the sound routine to slow the ball to a reasonable speed. The program worked fine without a delay when only one ball was involved, but when five balls started rolling, things got a little hectic. It would have been nice to have the balls fall at a faster rate than they rolled the rest of the way down the clock, but memory restrictions dampened any chance of such intricacies. I decided to increase the overall speed of the balls so the "fall" speed would be close to normal.

The sound routine is designed so any condition that warrants a "hit" sound is sent to that section of the routine. Otherwise, control falls through to the "roll" sound. Two sounds were tied together to approximate the sound of a rolling ball.

Usually I prefer the orange background because it gives more color to work with. The dark color also allows POKEing into screen memory without also POKEing a color into color memory. By the way, a simple way to add color is to add CO to the previously POKEd location, where CO equals 30720 (38400-7680, which is the beginning of color memory minus the screen memory). For example, POKE SC+(var),81:POKE SC+(var)+CO,(color).

A Little Ingenuity

To convert this program to another computer, try using the same program lines and change only the variables to allow for your screen size (for instance, to allow for the Commodore 64's 40-column screen). If your computer addresses screen locations with X and Y coordinates, try changing the DATA statements to four-digit numbers, such as 0215 where 02 is the X value and 15 is the Y value. These values can be obtained by the formulas: X=VAL(LEFT$(B(X),2)) and Y=VAL



At 12:59, the clock is fully racked with balls.

(RIGHT$(B(X),2)) in Microsoft BASIC. The DATA statements would have to be READ in as strings. For those of you with PRINT@ statements, similar results can be achieved by PRINTing an "o" or an "*" (or anything else that better resembles a ball) at the proper locations.

With a little ingenuity, this clock could be displayed on any computer, although it might require some fancy manipulating of PRINTTAB or other statements.

If you'd rather not type this program listing, just send $3 and a stamped, self-addressed mailer with blank cassette (no disks) to:

J. D. Wright
1030 Charles Street
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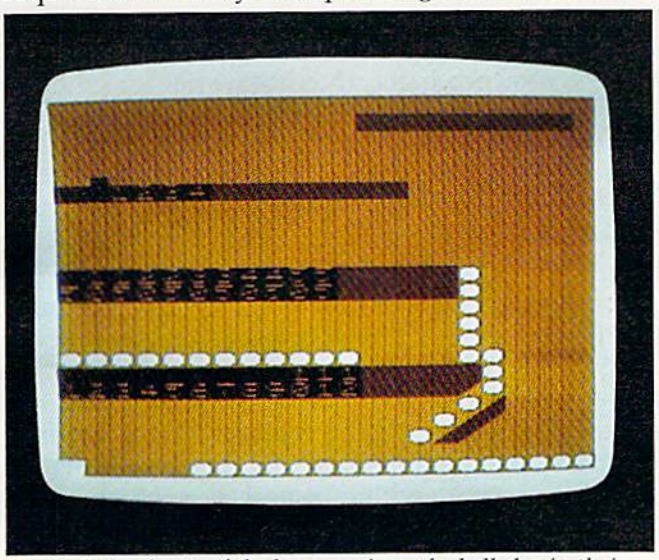
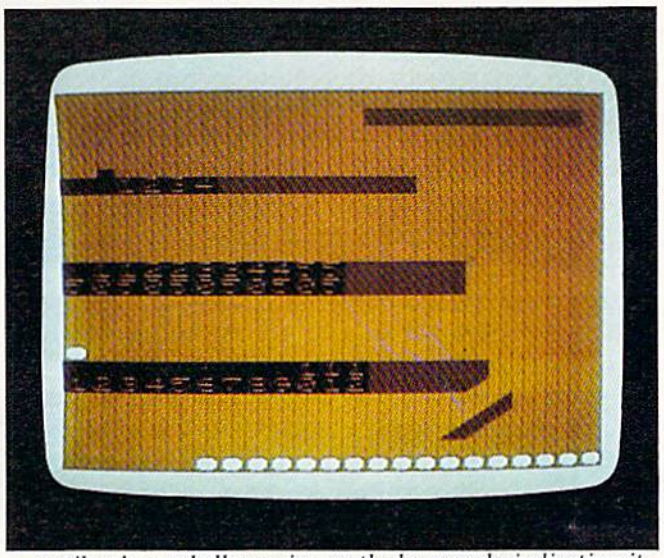
See program listing on page 124.



As the last minute of the hour expires, the balls begin their descent, triggering chain reactions among the other racks....



...until only one ball remains on the hour rack, indicating it is now 1:00.

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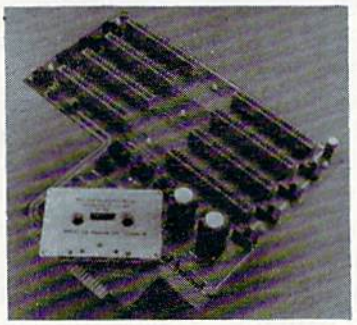

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VICreations

DAN CARMICHAEL

Let me tell you a little about myself first and then we'll get down to an interesting technique you can use – how to speed up your BASIC programs.

After studying computer science in the late 1960s, I entered the world of "data processing" at a relatively early stage in the computer revolution. My first job in the field involved what were then considered ultra-giant computers – IBM 370 168's. With a memory capacity of around eight million bytes, the 168's provided the programmer with a lot of room to work in.

I was so used to the large memory of these machines that when the first personal computers hit the consumer market around 1977, I was hesitant to buy one. After all, I figured, what can 16K offer to a programmer who is accustomed to working with millions of bytes of memory? I continued to resist home computers until 1981 when the VIC-20 hit the market. Its price – $300 then – was low enough to justify the experiment.

I bought one, and was pleasantly surprised. *Amazed* might be a better word. To put it simply, the VIC turned out to be a scaled-down version of the IBMs I loved so much. Just less memory, that's all. The VIC screen editor was surprisingly sophisticated. You can easily and quickly move the cursor anywhere you want to and change things efficiently on screen. (Many other computers have cumbersome editing.) And the other internal workings of the VIC turned out to be similar to the IBMs. Even the BASIC language in the VIC was very much like the BASIC emulator in the large IBMs. I've been fascinated with my VIC ever since. Like a good book, it's hard to pull yourself away from it.

Future Columns

This monthly column will contain everything from useful bits of information for the beginner (did you know that if you type POKE 650,128 and hit RETURN, every key on the keyboard will "repeat" if you continue to hold it down?) to helpful tutorials for the intermediate-level programmer.

We'll look at the best VIC software as it comes on the market and talk about the best new games. We'll even get into how to go about writing some games of your own. And there'll be useful programs and utilities to help you get the most out of your amazing "little" computer.

Above all, we'll explore the programs, techniques, new products, and discoveries that should make for many hours of fun, and fascination, with your VIC.

Speedy Variables

Sometimes one of the biggest problems when programming with BASIC (especially in writing games) is figuring out how to make the program run fast enough. It's no good playing slow-motion Ping Pong. There are ways, however, to squeeze more speed out of your BASIC programs. One simple way is to use more *variables*. The following programs will demonstrate this. The programs will fill the screen with dots and then tell you how many seconds it took to finish the job.

Carefully type in Program 1, type RUN, and press the RETURN key. (To type the clear-screen character [CLR] in line 10, hold down the SHIFT key and press the CLR/HOME key. You should then see a reversed heart character. If you have a problem, see "How To Type In *COMPUTE!'s Gazette* Programs" elsewhere in this issue.)

Program 1

```
10 PRINT"{CLR}":A=0:TI$="000000"
20 POKE 7680+A,81:POKE 38400+A,6:IF A=505
   THEN GOTO 40
30 A=A+1:GOTO 20
40 PRINT TI/60:END
```

The running time for Program 1 is approximately 12.16 seconds. The only variable used here is the variable "A", which serves to increment both the screen (7680 + A) and color (38400 + A) memory locations.

Now type in Program 2, and RUN it.

Program 2

```
10 PRINT "{CLR}":A=0:B=7680:C=38400:TI$="
   000000"
20 POKE B+A,81:POKE C+A,6:IF A=505 THEN G
   OTO 40
30 A=A+1:GOTO 20
40 PRINT TI/60:END
```

The running time for Program 2 is approximately 8.53 seconds, an increase in speed of 30 percent! The only changes we made in Program 2 were to define the numbers 7680 and 38400 as variables ("B" and "C") during the *initialization* (the preliminary definitions and instructions to the computer) in the program. Then we used these

variables in the program itself.

Now enter Program 3, and RUN it.

Program 3

```
10 PRINT"{CLR}":A=0:B=7680:C=38400:D=81:E
   =6:F=505:TI$="000000"
20 POKE B+A,D:POKE C+A,E:IF A=F THEN GOTO
    40
30 A=A+1:GOTO 20
40 PRINT TI/60:END
```

In Program 3, we have replaced *most* of the numbers in the program with variables. Remember that the variables were first defined for the VIC during the *initialization* phase of the program. Without first being defined, a variable would mean nothing to the computer later on in the program. The variable would just be a zero, and that would cause havoc.

The running time of Program 3 is approximately 6.7 seconds, almost twice as fast as Program 1, and a marked improvement over Program 2.

The trade-offs here are obvious. By using a little more of the VIC's memory to define variables, you can greatly increase the swiftness of your programs. Also, if these variables are used more than once in your program, you can *save* memory at the same time you're increasing speed. So you *can* have your cake and eat it too.

Speedy BASIC

You could also try the FOR/NEXT structure instead of the POKE we've been using so far (in Programs 1-3). Here's how.

Enter Program 4, and RUN.

Program 4

```
10 PRINT "{CLR}":A=7680:B=38400:C=81:D=6:
   F=505:TI$="000000"
20 FOR E=0 TO F:POKE A+E,C:POKE B+E,D:N
   EXT:PRINT TI/60:END
```

This version runs in just over four seconds. It's the fastest version yet.

Programming with the FOR/NEXT technique might be a bit more difficult. But in some cases, where speed is important, the extra effort would be worth it.

A Word About Machine Language

For maximum efficiency, for programs that run at lightning speed, machine language is the way to go. Machine language is the VIC's native language. It talks to *itself* in machine language; BASIC has to be "interpreted" while a program is running. This translating process can significantly retard progress from one instruction to the next. Of course, computers are so fundamentally fast that many programs don't require any extra speed. But some do. That's when the techniques we've looked at this month are worth knowing. Even so, in certain cases, machine language is the only solution. To see the spectacular speed of machine language, try Program 5:

Program 5

```
10 FOR A=7168 TO 7200:READ B:POKE A,B:NEX
   T
20 PRINT"{CLR}" PRESS ANY KEY,",,,"BUT DO
   N'T BLINK!!"
30 GETA$:IF A$=""THEN GOTO 30
40 TI$"000000":SYS7168:PRINT TI/60:END
50 DATA 162,0,169,81,157,0,30,169,6,157,0
   ,150,232,224,0,208,241,169,81
60 DATA 157,254,30,169,6
70 DATA 157,254,150,232,224,0,208,241,96
```

After many years of programming, I am still fascinated by the extraordinary speed of machine language.

As you can see, this program runs in just over 1/100 of a second, approximately 730 times faster than Program 1, which is written in BASIC. For those of you who are unfamiliar with machine language, there's no trick here. As a matter of fact, this program could have been written to run even faster, but you get the idea.

Machine language is an advanced topic and won't be covered in any detail in this column, but if you're interested, *COMPUTE!'s Gazette* for Commodore has a column on the subject, "Machine Language For Beginners," elsewhere in this issue.

If you've got questions or ideas about subjects you'd like to see covered in this column, write to: VICreations, P.O. Box 5406, Greensboro, NC 27403.

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64 EXPLORER

LARRY ISAACS

"64 Explorer" will be a regular column dealing with topics of interest to Commodore 64 users. Since this is the premiere column, perhaps a little bit about my background is in order (mixed with a few items of historical interest) before we begin our first explorations of the 64's BASIC language.

Eight Years Ago

I have had an interest in microcomputers since they first became available. At that time (around 1975), I was still in college, so naturally I couldn't afford one of my own. Instead, I had to be content reading all the literature and magazines I could lay my hands on. In those days, you had to know a lot about how your microcomputer worked in order to use it. Plus, you would typically have to do a lot of your own programming. Back then a microcomputer with as much memory as the 64 would have been quite expensive. And it would have weighed a ton, because at that state of technology it would have required a very large power supply.

It was during this time that I picked up most of my hardware design experience. This experience included designing a bit-slice (i.e., custom) minicomputer and working on some peripheral controllers for DEC minicomputers. Unfortunately, I wasn't able to pick up much experience on microcomputers.

Then came the Apple and Commodore PET computers. They were the first mass-market microcomputers for beginners as well as for more experienced people. Actually, the PET (short for Personal Electronic Transactor) could be considered the great-grandfather of the Commodore 64. When the PET was first introduced, there weren't many books or publications to help beginners learn about computing, and fewer still ready-to-run programs, so it was quite a challenge for a beginner to use a PET. Fortunately, things began to immediately improve with the formation of user clubs and the publication of a number of small but informative newsletters.

It was a short time later (the spring of 1979) that I joined Small System Services, which a few months later began publishing **COMPUTE!** (the parent magazine of *COMPUTE!'s Gazette*). It was at Small System Services that I got my first hands-on experience with microcomputers. Most of that experience was with the Commodore PET and CBM computers, though the Atari was not far behind.

I had been with Small System Services about a year when, in an effort to further my programming skills, I left to work for Micro Technology Unlimited. For the past three years, I have been writing or adapting programs almost exclusively, though my work still exposes me to a good deal of hardware. Most of my programming involves machine language, but I have also done a fair amount of programming in BASIC. And I have at least a little experience with some of the less widespread languages, such as Forth, Pascal, and C.

Virtually all my programming experience has involved the 6502 microprocessor. The 6510, which is the microprocessor chip at the heart of the Commodore 64, is identical to the 6502 except for a few minor changes. For programming purposes they can be considered virtually identical.

Tips, Translations, Small Applications

In this column, I plan to cover topics for all levels of users, but primarily for the beginner- to intermediate-level user. I will try to provide programming tips as well as useful information about the computer. Where feasible, I will discuss how to convert programs from other home computers, especially the VIC, for use on the 64, and I'll try to keep you up-to-date on new hardware and software products for the 64. From time to time, I will try to present small applications of my own which I hope will prove useful and instructive to you. Since this column is for your benefit, I invite you to send in your suggestions for subjects you would like to see covered.

Now let's move on to something you can put to use. As you may know, the 64 represents the state-of-the-art in inexpensive home computers.

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Yet it still shares a lot of similarities with Commodore machines that have preceded it. An advantage you have over owners of the early Commodore machines is the availability of helpful books and publications. This should make it easier to learn how to get more out of your computer. Your 64 came with a small book called the *Commodore 64 User's Guide*. It is written in tutorial style and provides a very brief introduction to the BASIC language. In most cases, it doesn't go into enough detail to prepare you to do actual programming.

If you've never written any programs before, you will soon learn that some of the things you're used to doing may not be acceptable to BASIC.

If you do plan to do some of your own programming, a book you should buy is the *Commodore 64 Programmer's Reference Guide*. It provides information on a wide variety of subjects, and in much greater detail. In my next column, I will briefly review this book, and in the future I will try to mention sections of this book where you can find additional information related to subjects covered in the column.

Microsoft BASIC

If the 64 is your first computer, and you're planning on doing some of your own programming, then chances are that BASIC will be your first computer language. Several different versions of BASIC have been developed by various companies. Each has its own style or flavor.

The BASIC which is built into the 64 comes originally from Microsoft, Inc. It is an early version of Microsoft BASIC, which means that it is missing some features sometimes found in newer or "extended" BASICs. But, for most applications, this simpler version will prove sufficient, and it has the advantage of taking up less memory. Enhancements to BASIC have already begun to hit the market, so those who would like some of these extra features will not have to do without. I will try to keep you posted on the enhancements as they become available.

Some Terms

Before discussing some things concerning the 64's BASIC, I had better define a couple of terms first. Some of the time I may refer to BASIC *commands*, and other times I may refer to BASIC *statements*. Some of you might wonder what the difference is. Generally speaking, there isn't any difference. Strictly speaking, a BASIC statement is any "sentence" which is executable by BASIC, and is thus the more general term. BASIC commands are typically those BASIC statements which are executed as *direct* commands (that is, instructions typed in without line numbers for immediate execution). This implies that the other statements, not called commands, are typically used within programs.

The *Commodore 64 User's Guide* categorizes CONT, LIST, LOAD, NEW, RUN, SAVE, and VERIFY as commands, and the rest as statements. I will try to follow this terminology, but in some cases it isn't obvious whether a statement is being used as a command or not. In such cases, my choice will depend mostly on my mood. For example, it may seem more natural to say "OPEN command" rather than "OPEN statement" if it is being executed as a direct command.

Another important term I will be using in this column is the word "enter." I use "enter" to refer to a line or lines that should be typed into the computer with each line being terminated by pressing RETURN. So, if I indicate that you should enter "NEW," you should type "NEW" followed by a RETURN.

If you've never written any programs before, you will soon learn that some of the things you're used to doing may not be acceptable to BASIC. A prime example is the use of commas in numbers. When writing numbers for other humans, we are taught to place commas in the number for the millions and thousands (i.e., 1,000,000). But, in BASIC, the comma is used to separate various items from one another; you write 3100, not 3,100. BASIC would interpret 3,100 as three followed by 100.

CHRGET Routine

One of the things that gives the 64's BASIC its flavor is a routine called the CHRGET routine. This is not a BASIC routine, but a machine language routine which is part of the BASIC interpreter program. For those new to programming, the BASIC interpreter program is the program the 64 is executing while you are using BASIC. The computer chip in the 64 isn't made to execute BASIC statements directly, so a program is needed which can interpret the BASIC statements and perform the specified action.

The CHRGET routine is used by the BASIC interpreter to fetch the next character from your BASIC program or direct command. It isn't the only way the BASIC interpreter fetches the next character, but it is the one used in most situations. Thus, the characteristics of this routine have a major effect on the way certain things operate in this BASIC.

For example, the CHRGET routine will skip spaces. If the character fetched is a space character, the CHRGET routine will throw it away and fetch the character following the space. It will repeat this process until a non-space character is found. The result is that the BASIC interpreter won't see any difference between "FOR I=1 TO 10" and "FORI=1TO10". There are other times where the results can be somewhat unexpected. For example, BASIC also uses the CHRGET routine to fetch the digits found in numbers. Consequently, BASIC doesn't see any difference between "9999" and "99 99". Enter the following to see this for yourself:

```
PRINT VAL("9999"),VAL("99 99")
```

It must be noted, though, that the spaces are thrown away only when the statements are being executed, and not when they are entered.

Statement Terminator

Another characteristic of the CHRGET routine is that it will signal when the end of a statement has been reached. It decides that it has reached the end of a statement when it finds a colon (:) or a zero-byte character (i.e., a character whose ASCII value is zero, not to be confused with a "0" character which has an ASCII value of 49). You need not concern yourself with the zero-byte character since it is automatically put at the end of each line by the BASIC interpreter. This is not the case with the colon, whose special status as a statement terminator can also cause unexpected results. For example, try entering and running the following one-line program:

```
10 INPUT T$:PRINT T$
```

The INPUT statement will make the computer display a question mark and pause while it awaits some response from you. Then enter:

```
ABCD:EFG
```

as your response to the INPUT statement. The 64 will display:

```
?EXTRA IGNORED
ABCD
```

As you can see, the colon in your response had the effect of terminating input into the T$ variable. The "EXTRA IGNORED" message is to let you know that there was more on the line which was not used. You might expect that changing the program to:

```
10 INPUT T1$,T2$:PRINT T1$,T2$
```

and entering the same response would get rid of the "EXTRA IGNORED" message, but this is not the case. If you enter the same input, BASIC will display "??" indicating that the INPUT statement wants more data. This happens because the colon doesn't just separate, but terminates the input for that line as well. It is as if you entered a RETURN after the "D" instead of the colon.

As previously stated, the comma is the character used to separate items from one another. If you enter "ABCD,EFG" in the two examples above, you would find that the first example works the same, but the second works as expected. "ABCD" and "DEF" are read into T1$ and T2$, respectively. The comma does not have the terminating characteristic that the colon does.

Special-Purpose Characters

With this special treatment given to the comma and colon, it would appear that using them as normal characters would be difficult. However, this is where another character which receives special treatment comes in handy. This character is the quote mark ("). Any sequence of characters found between quotes will be interpreted as a literal string, which means that BASIC won't use the CHRGET routine to fetch the characters. As a result, the comma and colon won't receive the usual special treatment. The only difficulty that remains is embedding quotes within a string. This is accomplished by specifying the quote as CHR$(34) (the character code number for ") and combining it into the string at the desired places. For example, the statements:

```
PRINT CHR$(34);"PRINT THIS WITHIN
  QUOTES";CHR$(34)
T$=CHR$(34)+"PRINT THIS WITHIN
  QUOTES"+CHR$(34):PRINT T$
```

will both print a sequence of characters between quotes. The first statement prints it directly; the second places the string into a variable first, then prints the variable.

The moral of this story is that BASIC may not always do what you might expect. The Microsoft BASIC in the 64 uses some characters for special purposes, which in other situations can give unexpected results. As you become better acquainted with BASIC, these surprises will occur less often. I will try to cover more of these operational details in future columns.

One Final Tip

As one final tip for this month, I would like to point out that FN is a *reserved keyword* – it may not be used as a variable name. Remembering this could save a lot of time, and a lot of hair-pulling. On more than one occasion I have tried to use FN$ as a string variable to hold a file name. The result is a SYNTAX ERROR which can be very difficult to see if you forget that FN is reserved. I have stared at the offending statements for longer than I would care to admit before remembering this simple fact. I hope you won't make the same mistake, at least not more than once.

64 Paddle Reader Routine

Bobby Williams

Beginning this month, "Power BASIC" will be a series of short utilities and routines which use machine language to enhance the power and usefulness of your computer's BASIC. You do not need to understand machine language to use these routines – each will be presented in the form of a short BASIC program ready to type in and use.

If you've ever tried to use the Commodore 64 paddle controllers in a BASIC program, you may have noticed how the value you PEEK to read the paddles "jitters" or jumps around even when the paddle isn't touched. This is due to the analog-to-digital conversion going on, plus the paddle's sensitivity.

The VIC doesn't seem to suffer as much from this "jitter." So what can we do to get the 64's paddles to "calm down"?

One way is to read the paddle several times and average the results. This could be done with a short loop in BASIC. But even a very short loop in BASIC is relatively slow, especially if you're trying to read the paddle very fast, as in a game. The answer is to use machine language.

256 Readings Per Split Second

Don't worry – you won't need to understand machine language to use the following program. It's been converted into a *BASIC loader*, a short BASIC subroutine which loads the machine language into memory as part of your regular BASIC program. The routine reads the paddle 256 times in a split second and takes the average as the final value.

All you need to do is add these lines to the beginning of any new or existing BASIC program that uses the paddles:

```
10 PR=49152:FOR I=0 TO 16:READ A:POKE PR+
    I,A:NEXT
11 DATA 169,0,170,168,24,109,25,212,144,1
    ,200,202,208,247,132,251,96
```

When you want to read the paddle, simply type:

```
SYS PR:PA = PEEK(251)
```

We are PEEKing memory location 251 instead of the actual paddle location (54297) because that is where the subroutine stores the average that you want.

X And Y Coordinate Readings

If you want the paddle reading to be an X or Y coordinate of a sprite, simply use these lines instead of those above:

```
10 PR=49152:FOR I=0 TO 17:READ A:POKE PR+
    I,A:NEXT
11 DATA 169,0,170,168,24,109,25,212,144,1
    ,200,202,208,247,140,LO,HI,96
```

Fill in "LO" with the low byte and "HI" with the high byte of the sprite's X or Y address. This will automatically update your sprite position when you type SYS PR (either as a line in your program or directly from the keyboard).

Both of these routines read the X paddle. If you want to read the Y paddle, change the 25 in the DATA statements to a 26. Also, the variable PR in line 10 may be any value where you have 17 available memory locations. For example, to store the routine in the cassette buffer, make PR = 828.

This machine language routine is so fast that even though it reads the paddle 256 times during each call, it is only about eight microseconds slower than a single PEEK in BASIC.

MACHINE LANGUAGE FOR BEGINNERS

RICHARD MANSFIELD, SENIOR EDITOR

A Hidden World

There's something amazing beneath BASIC.

Each month in this column we'll explore the mysterious, powerful world of machine language. Along the way, we'll try some fascinating tricks and techniques. Everything will be designed to give you hands-on experience using ready-made, easily typed-in examples. I hope that you'll soon come to feel that machine language is not much more difficult to learn or to use than BASIC.

From time to time you'll hear someone say that they could never learn to program in BASIC because they aren't good at math. If you've done any BASIC programming, you know that math has little to do with it. You can *choose* to write complicated mathematical programs, but few home computerists want to or need to. Instead, most of us write games, practical applications programs, music, or whatever interests us. But not math. BASIC commands such as SIN, TAN, and COS just sit there unused.

Going Below BASIC

Likewise, many BASIC programmers hear about this mysterious *machine language* and think that it's only for physicists, engineers, or advanced professional programmers. For example, an author will explain that he or she wrote a game in BASIC, but added machine language in certain places for speed. Somewhere in the same article you might see a "program listing" of the machine language part and be convinced that it's a lot less understandable than BASIC. After all, machine language uses special three-letter abbreviations instead of the English words of BASIC.

It *is* somewhat easier to learn the meaning of the STOP command than its machine language equivalent, BRK. But they do pretty much the same thing – they stop a running program – and it's not that hard to remember that BRK is just shorthand for BREAK. But we're getting ahead of ourselves. Let's first try to define what machine language is and also try out some easy, preliminary excursions "below" BASIC. To understand the meaning of machine language we should first take a brief look at how BASIC itself works. Try typing in and RUNning the following:

VIC Version:

```
10 ? CHR$(14)
20 FOR I = 49310 TO 49610: ? CHR$(PEEK(I));:
   NEXT
```

64 Version:

```
10 ? CHR$(14)
20 FOR I = 41160 TO 41560: ? CHR$(PEEK(I));:
   NEXT
```

Here we are PEEKing into the section of your computer's memory which contains BASIC *as a program* on a *Read Only Memory* (ROM) chip – which is never erased. In the VIC, BASIC takes up memory locations 49152 through 57343, and in the 64 it goes from 40960 through 49151. In both cases, BASIC uses up 8K of memory, somewhat more than 8000 bytes. What we're PEEKing here is a list of the BASIC command words. Also, at the end of that list is another "table" of words which are the computer's error messages. (Notice that the computer can tell when a word ends and a new one begins because the last letter is capitalized.)

BASIC is just another program – albeit a very large program. But BASIC itself is not *written* in BASIC. *BASIC is a machine language program.*

Following The Trail

BASIC is a language that both you and your computer can easily understand. It's the way you communicate your instructions (your programs) to the VIC or 64. That list of words we just extracted is sometimes called a *lookup table* and contains the 50 or so commands that you can use to

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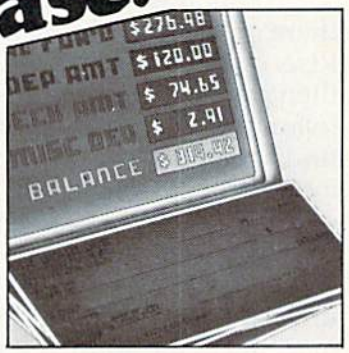

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program in BASIC. Let's see roughly what happens when you communicate with your computer in BASIC. How is the word "Utah" printed on the screen?

First we type in:

```
10 PRINT "UTAH"
```

Then, if we announce to the computer that there is a program in memory to RUN (by typing RUN), it will look for the lowest line number and then *analyze* the meaning of your instructions following the line number. In this case, it would find a match to the instruction "PRINT." After it located the match, it would then look down a separate list of memory addresses. If PRINT is the sixth word on the "words list," then the computer would count down to the sixth word on the "addresses list" and would send control of your machine to the address it found. At that address is a machine language program which handles PRINT commands.

Now we can begin to see why programmers want to learn machine language – programs run far more efficiently than they ever could in BASIC. Why? Because BASIC is an "interpreter." BASIC must interpret each instruction *while a program is running*. What's more, a command like PRINT is very general. Not only does BASIC need to find out where (in ROM memory) the PRINT instructions are located, it must then also interpret a number of additional things. What's the format for the requested PRINTing? Is there a TAB or SPC to deal with? A comma or semicolon?

In our Utah example, there isn't any special format so BASIC must then decide if this is a request to print a literal string (something inside quotes), a variable, or a number. And so on. Each question must be answered by the computer before it can start putting something on the screen. And all this takes time.

BASIC always has to keep track of the current location of the cursor on the screen. This is how it knows where to put the next item it PRINTs. By the way, you can directly control the location of your cursor by POKEing new numbers into the place that BASIC looks for this information. On both the 64 and the VIC, the line location is held in address 214 and the position on that line is in address 211. You could type: POKE 214, 12 and the cursor would be moved down to the twelfth line. Or try POKE 211,10: PRINT "X".

We've just followed the trail of the PRINT instruction, from lookup through execution. Remember that all of these events are going on while BASIC is executing a program. This approach is tolerably fast for many applications. After all, the computer can fly around asking and answering questions at impressive, electronic speeds.

Yet, because BASIC *is* all-purpose – it's the Beginner's All-purpose Symbolic Instruction Code – it's never as fast as machine language. Machine language can be hundreds of times faster because you can print UTAH without needing to check for a quote or find a variable somewhere else in memory or whatever. You write a machine language program which is customized, tailored to serve no other function than to put the word UTAH where you want it. In one sense, printing Utah via machine language means that you are constructing a new BASIC command word which might be called PRINTUTAH.

An Experiment In High Velocity

Here's one final experiment. You'll see what's meant by machine language speed and how valuable it is when you're writing games. It will also illustrate the way that machine language can be *combined* with a BASIC host program. The machine language part is that series of numbers in the DATA statements. When RUN, these numbers are POKEd into memory to form a short machine language program that will fill your screen with whatever key you press. And it will change the entire screen instantly when you hit a different key.

64 Version

```
10 FOR ADDR = 40000 TO 40017: READ NUMBE
   R: POKE ADDR,NUMBER: NEXT
20 DATA 173,0,4,160,0,153,80,4,153,80,5
30 DATA 153,80,6,200,208,244,96
40 GET A$:IFA$=""GOTO40
50 POKE1024,ASC(A$):SYS40000:GOTO40
```

VIC Version

```
1 FOR A=828 TO 869:READ B:POKE A,B:NEXT
2 DATA 160,0,177,251,145,251,200,208,251,
   162,255,134,251,145,251,200,208,251,16
   9,6,145
3 DATA 253,200,208,251,162,255,134,253,14
   5,253,200,208,251,162,0,134,251,134,25
   3,96,234
10 PRINT"{CLR}{DOWN}PRESS ANY KEY":POKE 2
    51,0:POKE 252,30:POKE 253,0:POKE 254,
    150
20 IF 4*(PEEK(36866)AND 128)+64*(PEEK(368
    69)AND 112)=4096 THEN POKE 252,16:POK
    E 254,148
30 GET A$:IF A$="" THEN 30
40 PRINT"{HOME}"A$:SYS828:GOTO 30
```

After the numbers are POKEd into place, the computer executes the machine language program by a SYS command. This is essentially a GOSUB, but the target isn't a BASIC line number. Rather, it's the starting address of a machine language routine. When finished, control is returned to BASIC just as if the machine language routine had ended with a RETURN. The VIC version is a little longer to allow the program to work correctly on any memory configuration.

We'll get into further explanations in the months to come, but you might want to write a short BASIC program to accomplish the same fill-the-screen task. You'll then know why many people find that learning machine language is well worth their time.

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Enlivening Programs With Sound

Gregg Peele, Programming Assistant

Have you been to a coin arcade lately? If you have, then you know the impact that sound has on the excitement of a video game. Whizzes, bangs, and explosions of all sorts are mixed with melodies and other special effects. Although the visuals provide most of the stimuli within a game, good sound effects add that final professional touch.

How can sound be used effectively within a program? Naturally, collisions, explosions, and other climactic events occurring on the screen need the added realism of sound. But don't limit its use to these special effects.

Sound can add a spark of interest to a particularly dull section of a game. Maybe it takes ten or 20 seconds to set up the screen for your game. By adding sound to this part of your program, you can maintain the interest even though, visually, not much is happening.

Sound can also serve more practical purposes within other types of programs. A small beep can signal an error condition or remind the user that the computer needs attention.

Fortunately, Commodore has built excellent sound capabilities into both the VIC-20 and the Commodore 64. The 64, in fact, contains one of the most sophisticated sound-producing systems of all personal computers, a true "synthesizer-on-a-chip." Commodore plans to use the full potential of the 64's sound capability when it releases its plug-in synthesizer keyboard later this year. Commodore also is readying a plug-in drum synthesizer for both the 64 and the VIC.

With these new peripherals, a revolution in sound is beginning for Commodore users. We'll be covering this subject regularly in *COMPUTE!'s Gazette* for Commodore.

Fanfare

This month, here's a sound effect which may be used to add a bit of excitement to almost any program. There are two listings – one for the 64 and the other for the VIC. The routine produces an arcade-style "fanfare" for some triumphant moment within a game.

The addition of sound can enhance almost any computer program. Don't neglect the added dimension that sound can add to your computing.

See program listings on page 114.

HINTS&TIPS

Accelerated IFs

Kurt Carpenter

If you've discovered a clever time-saving technique, or a brief but effective programming shortcut, send it in to "Hints & Tips," c/o COMPUTE!'s Gazette *for Commodore. If we use it, we'll pay you $35.*

Microsoft BASIC for the VIC-20 and Commodore 64, and probably for other computers as well, will always execute an entire IF-THEN statement before rendering a decision. For example:

```
IF (A=1 AND B=2 AND C=3) THEN X=1
```

In this statement, even though A is not equal to one, B is still checked for two and C is checked for three before this statement is found to be false.

Therefore, you can speed up a program by replacing an IF statement of this type with multiple IF statements, including the most likely to fail first, the next most likely second, etc. The above example would be changed to:

```
IF A=1 THEN IF B=2 THEN IF C=3
  THEN X=1
```

This costs only one byte of memory per each additional IF. In programs where execution speed is critical (such as games), the time savings are worth it.

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Using Joysticks On The Commodore 64: A BASIC Tutorial

Charles Brannon, Program Editor

Taking advantage of the Commodore 64's fascinating capabilities often involves PEEKs and POKEs which can be confusing at first. This article explains the essentials of using joysticks in your own BASIC programs.

First of all, if you don't yet own a Commodore joystick, you can use the readily available Atari joysticks, or any *Atari-compatible* joystick – which gives you quite a choice. A number of "custom" sticks are available from outside companies. (This is fortunate, because Atari recently won a court order blocking Commodore from selling its Atari-lookalike joysticks, so it may be awhile before we see a redesigned model.)

The Inside Story

To really understand joysticks, you have to know how they work. Don't worry; joysticks are no more complicated than a light switch. In fact, inside the base of the joystick are five switches that act like pushbuttons. When you press the joystick north (up), south (down), east (right), or west (left), or press the joybutton, a switch is closed.

You can also move the stick diagonally (NE, SE, SW, NW). How can four buttons give you eight directions? Simple. The joystick is designed so that diagonal movement closes two switches simultaneously.

Joy Bit

Each switch controls one part of a memory location inside your computer. These are called *bits*. A bit can hold only two values – either zero or one. Zero normally means nothing, false, empty, off. One means positive, true, on. Although it may seem confusing at first, the joystick bits are reversed. When the joystick is centered (not deflected in any direction), all the bits are "on." They are all ones. But if you move the joystick up, the "north" bit will become a zero. If you move the joystick diagonally to the lower right, both the "south" and "east" bits will become zeros.

Siliconomics

Joysticks would be easier to use if each direction had its own separate memory location. That way, you could check the north, south, east, west, and joybutton bits separately. But to economize (and you always do when designing microchips, where the cost is more than proportional to the amount of silicon used), all the bits are grouped together into a single memory *byte* (eight bits = one byte). The bits are ordered like this:

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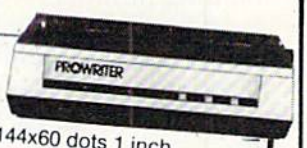

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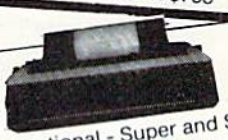

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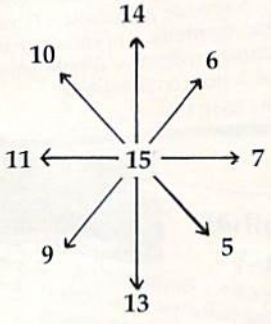
Direction	Value When Off (Zero When On)
North:	1
South:	2
West:	4
East:	8
Button:	16

As we'll explain shortly, your program will detect which way the joystick is deflected by looking at this byte. The number in the byte will be the sum of all these values. Here's how it works.

Let's ignore the joybutton for a moment. If the stick is not moved, the summed value in the byte would be 15 (1+2+4+8=15). If the stick were moved up (north), the north value would become zero, and the remaining numbers would add up to 14. If the joystick were moved left (west), the west value would become zero, and the remaining numbers would add up to 11.

The easiest way to use the joystick is to read the memory location with the BASIC command PEEK and use IF/THEN statements to take appropriate actions for each direction. Refer to this diagram:



A series of IF/THEN statements might look like this:

```
10 V=PEEK(56321)AND15
20 IF V=14 THEN PRINT "NORTH"
30 IF V=13 THEN PRINT "SOUTH"
40 IF V=7 THEN PRINT "EAST"
50 IF V=11 THEN PRINT "WEST"
60 IF V=6 THEN PRINT "NORTHEAST"
70 IF V=5 THEN PRINT "SOUTHEAST"
80 IF V=9 THEN PRINT "SOUTHWEST"
90 IF V=10 THEN PRINT "NORTHWEST"
100 IF V=15 THEN PRINT "CENTER"
110 GOTO 10
```

Line 10 reads the value of the joystick byte and keeps it in a variable, V. The number 56321 is the memory location for joystick port #1. PEEK reads this location, but you won't get just values from 0-15. Other functions are also read here, such as the joybutton. The "AND15" isolates the values we're looking for by turning off all the other unwanted bits. I won't explain here why this works – just take my word for it!

Who's On First?

You can read the second joystick (port #2) by substituting the number 56320 for 56321 in line 10. It might seem logical that the joystick which is read by PEEKing location 56320 should be the "first" joystick, since it has the lower number, but that's not the way it works. You can't argue with the lettering on the side of your Commodore 64 which clearly shows which is first and which is second.

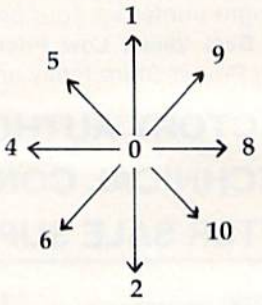
Also, you'll notice that the first joystick will seem to "press" certain keys on your keyboard. This is a hardware anomaly, but you can play some joystick games by pressing keys in the upper left part of your keyboard. It is not a reliable method, however.

Another Way

Although the sample program above will read the joystick, it's not necessarily the best way. IF/THEN statements are among the slowest statements in BASIC, so if speed is important (as in games), there are better ways to go. Here's a faster method. Change line 10 to:

```
10 V=15-(PEEK(56321)AND15)
```

Now the values returned will be:



Notice that the range is smaller here. You can now use the values as the index to an array. Watch how it works. Let's shorten the example program:

```
10 FOR I=0 TO 10:READ A$:
   MESSAGE$(I)=A$:NEXT I
20 DATA CENTER,NORTH,SOUTH,,WEST,
   NORTHWEST,SOUTHWEST,,EAST,
   NORTHEAST,SOUTHEAST
30 V=15-(PEEK(56321)AND15)
40 PRINT MESSAGE$(V):GOTO 30
```

MESSAGE$ (pronounced "message-string") is a *string array*. A string array is a single variable name that holds a whole list of strings (a string is any series of characters). Each string has its own box or place in the array. We address the item in the list by calling its number. The READ loop on line 10 fills the MESSAGE$ array with the ten strings. If we say PRINT MESSAGE$(0) we'll get "CENTER". PRINT MESSAGE$(5) gives "NORTHWEST"

Some of the DATA items are followed by two commas, which are separators. The computer interprets this to mean that between the commas there is a "null" (empty) string. It saves us from having to include items we don't need (since some

of the numbers in the range 0-10 don't correspond to any joystick direction).

Table Look-Up For Speed

Printing the messages indirectly by using the joystick number is a form of *table look-up*. Instead of having the computer go through a bunch of IF/THENs, or searching a list for an answer, table look-up is direct and fast. All the answers are already determined. This is especially useful for games, where speed is important. For example, you could use a different character for any direction the player is facing, and put them into an array to be selected by the joystick number.

Tricky Techniques

You can also read the joystick by "masking" (isolating) the bits you are looking for. Remember that each direction has a number associated with it. If we want to check for north, we just check to see if the north bit has turned to zero. If we're checking for north this way, we'll capture northeast and northwest as well, which we wouldn't have caught with a mere IF/THEN statement.

Here we'll "mask" out the north bit:

```
V=(15-PEEK(56321)AND15) AND 1
```

If V=0, the joystick is not deflected north. If V=1, the joystick is being moved north, northeast, or northwest.

To check for left (west):

```
V=(15-PEEK(56321)AND15) AND 4
```

If V=0, there is no movement to the left. If V=4 (yes, 4, not 1), then the stick is being pressed left, northwest, or southwest. See how you can separate the original four directions from the eight possible ones?

So, to check for any direction, use:

```
V=PEEK(15-PEEK(56321)AND15) AND number
```

V (or whatever variable you use) will be either zero (not deflected) or non-zero (deflected). Substitute 1, 2, 4, or 8 for *number* (1=up, 2=down, 4=left, 8=right).

The Joybutton

You can check for the joybutton, also called the fire button or trigger, with:

```
B1=PEEK(56321)AND16 (for port #1)
B2=PEEK(56320)AND16 (for port #2)
```

A zero value means the button is pushed. A non-zero value (16) means the button is not pushed. For example, if you are waiting for the user to press the button to begin a game, you could use a loop:

```
500 IF (PEEK(56321)AND16)<>0 THEN 500
```

It's A Natural

Using a joystick in your next game will make it easier to play, since joysticks seem more "natural" than pressing keys on the keyboard. But remember that a joystick is just a tool. It will not move objects around for you – it will just tell you how the user is deflecting the joystick. Watch for future articles on how to achieve joystick-controlled animation.

There are other uses for joysticks besides games. Unlike the keyboard, with its 50-odd keys to deal with, the joystick limits input to just nine possibilities (the eight directions and the joybutton). The joystick can be used to select menu options, answer simple questions (left=no, right=yes), and even enter text (as you do with arcade games when you set the high score). Study the following example program for more ideas.

See program listing on page 125.

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Authors: **COMPUTE!** Magazine contributors
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Users of other popular personal computers have been enjoying their **COMPUTE! Books**: *COMPUTE!'s First Book Of PET/CBM, Programming The PET/CBM,* and others.

Now, there's a book devoted exclusively to the Commodore VIC-20™ Computer: *COMPUTE!'s First Book Of VIC.*

The editors of **COMPUTE!** Magazine – the leading resource for the VIC-20 – gathered together the best VIC-20 articles published since the summer of 1981 and added some new material. The result is more than 200 pages of valuable information – information that goes beyond the instruction manuals. In the **COMPUTE!** tradition, it is carefully edited to be easily understood and useful for beginners and experts alike.

COMPUTE!'s First Book Of VIC is spiral-bound to lie flat, and includes ready-to-type program listings and articles such as "The Joystick Connection: Meteor Maze," "STARFIGHT3," "Train Your PET To Run VIC Programs," "Renumber BASIC Lines The Easy Way," "High Resolution Plotting," "Custom Characters For The VIC," "VIC Memory – The Uncharted Adventure," and "A Simple Monitor For The VIC."

At only $12.95, less than most computer manuals, *COMPUTE!'s First Book Of VIC* is among the best resources a VIC user can own.

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Available at computer dealers and bookstores nationwide. To order directly call TOLL FREE 800-334-0868. In North Carolina call 919-275-9809. Or send check or money order to **COMPUTE! Books**, P.O. Box 5406, Greensboro, NC 27403.

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COMPUTE!'s Machine Language For Beginners

Author: Richard Mansfield
Price: $12.95
On Sale: Now

One of the most exciting moments in computing is when a beginner writes his or her first program which actually works... usually after hours of effort. A new world opens up.

But as beginners grow into intermediate programmers and become more fluent in BASIC, they realize the language's limitations – slow speed, and the lack of total control over the inner operations of the computer. They often develop an admiration for the fast, smoothly running machine language programs that mark commercial software. Unfortunately, too many people view machine language as mysterious and forbidding, and they are reluctant to tackle it themselves.

COMPUTE! Books' latest release, *Machine Language For Beginners*, by Richard Mansfield, introduces newcomers to the challenges of machine language with a unique approach. Aimed at people who understand BASIC, *Machine Language For Beginners* uses BASIC to explain how machine language works. A whole section of the book explains machine language in terms of equivalent BASIC commands. If you know how to do it in BASIC, you can see how it's done in machine language.

Machine Language For Beginners is a general tutorial for all users of computers with 6502 microprocessors – with examples for the Commodore 64, VIC-20, Atari 400/800/1200XL, Apple II, and PET/CBM. The numerous machine language programs will work on all these computers.

As a bonus, *Machine Language For Beginners* includes something that all fledgling machine language programmers will need to get started – an assembler. The "Simple Assembler," written in BASIC for the various computers, takes the tedium out of entering and assembling short machine language programs. The book even explains how to use the built-in machine language monitors on several of the computers. And it includes a disassembler program and several monitor extensions.

This book fills the need for a solid, but understandable, guide for personal computing enthusiasts. Mansfield is Senior Editor of **COMPUTE!**. His monthly column, "The Beginner's Page," has been one of **COMPUTE!**'s most popular features.

In the **COMPUTE!** tradition, *Machine Language For Beginners* has been written and edited to be straightforward, clear, and easily understood. It is spiral-bound to lie flat to make it easier to type in programs.

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NEWS & PRODUCTS

Software Menu For VIC-20

VIC Pak #1, a series of seven elementary programs for the VIC-20, has been introduced by Computer Software Associates. The package is described as an "introduction for the novice computer user."

VIC Pak #1 comes on cassette with a suggested price of $19.95. It loads seven programs, all of which are written in BASIC. They are:

- Mortgage – a program that allows the user to find the unknown variable for the principal, monthly payment, term, and annual interest of a mortgage loan.
- Elements – a quiz on naming the chemical symbol associated with each of the chemical elements.
- Statistics – an introduction to using the VIC-20 as a sophisticated calculator.
- Calendar – a program that produces any calendar month from AD 1 to AD 9999.
- Marblestat – a program that illustrates the computer's ability to imitate real-life events via programming.
- Expectancy – a formula to calculate a rough life-expectancy estimate.
- U-Draw – a simple graphics drawing program in eight colors.

MicroSoftware International
50 Teed Drive
Randolph, MA 02368
(617)961-5700

VIC-20 Hardware Products

World Electronics has released three hardware products for the VIC-20 – the UCA-20 Universal Cassette Adapter, the Universal Parallel Printer Cable, and the Memory Port Expander. Each sells for $19.95.

The Universal Cassette Adapter plugs into the cassette port of the computer and into any cassette recorder through the MIC and MONITOR jacks. The adapter has filters and amplifiers to improve the tape signal. However, the adapter is unable to duplicate the Commodore Datassette's ability to signal the computer if a button has been pressed. The computer will always assume a button has been pressed.

The Universal Parallel Printer Cable plugs into the user I/O port and allows the VIC to print on any Centronics standard parallel printer. The documentation includes a BASIC listing that allows anything printed on the screen to go to the printer as well, and an assembly listing with four optional modes, including one that adds PRINT@ and LIST@ commands to BASIC. The routine also is available on cartridge.

The Memory Port Expander plugs into the memory expansion port and duplicates that port to three connectors. Each of the newly created ports has all of the address, data, and signal lines of the original. A row of DIP switches allows the user to disconnect power to any of the connectors.

World Electronics
117 27th Street
Brooklyn, NY 11232
(212)499-5400

Nine Programs For Commodore 64

Creative Software, a publisher of software for the VIC-20, is entering the Commodore 64 market with nine titles – five home applications programs and four

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Home Accounting Package	39
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CBM EasyFinance	50
CBM EasyScript	80
CBM EasyFile	80
Data Manager	70
Stock(investment analysis)	80
Pet Emulator (emulates 4.0 basic)	30
Sprite-Magic (use joystick to design sprites)	19
Assembler Package (cassette or disk, compiled, includes editor, loader, disassembler)	39
Spacebelt	20
Retroball	34

INTERFACES & ACCESSORIES

80 Column Expander	$159
VIC 1600 Modem	95
VIC 1650 (auto answer, auto dial)	150
VIC 1525 Graphic Printer	329
VIC 1530 Datasette Recorder	65
VIC 1541 Disk Drive	329
VIC Switch (connect 8 64's or Vics to printer, dd)	149
IEEE Interface (64)	85
PET-IEEE cable	33
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Parallel Interface (Epson, Okidata, IDS, NEC)	80
RS-232 Printer Interface (Okidata, Diablo, etc.)	60
Programmers Reference Guide	18
Verbatim Diskettes (10 per box)	26
Victree (Programmers Utility)	75

VIC PRODUCTS & ACCESSORIES

8K RAM Memory Expansion Cartridge	$ 40
16K RAM	70
24K RAM	105
VIC IEEE Interface	75
VIC 3 Slot Expander	27
VIC 6 Slot Expander	70
RS-232 Printer Interface	65
Cassette Interface	27
Home Finance Package (6 tapes)	47
Gorf (64 also)	30
Omega Race	30
Arcade Joystick - Heavy duty w/2 firing buttons! Great for the VIC or 64	25

MONITORS - GREAT RESOLUTION (64 OR VIC)

Amdek Color I	$ 299
Amdek II or III	call
Panasonic CT160	279
Comrex 6500 - 13" Color	299
Transtar 20 (High Resolution Green Phosphor)	129
Video/Audio Cable	15

PRINTERS - LETTER QUALITY

CBM 8300, 40 cps	$1450
Diablo 620, 25 cps	949
ComRiter, 17 cps	819
Transtar 130, 16 cps (auto load, wp features!)	769
NEC 7700 series	2350
NEC 3500 series	1600

PRINTERS - DOT MATRIX

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Epson MX-80 w/Graftrax	349
CBM Graphics for Epson	65
Okidata 82A, 120 cps (serial and parallel)	429
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CBM D9090, 7.5 mg. Hard Disk	2600
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games.

The five home application titles are translations of current VIC-20 programs. They are: *Household Finance, Home Inventory, Loan Analyzer, Car Costs,* and *Decision Maker.*

Of the four game titles, two, *Astroblitz* and *Trashman*, are translations of VIC-20 games, and two, *Moondust* and *Save New York!*, are original works.

The home applications programs are available on tape and disk, and the games come in cartridge format.

Creative Software
230 E. Caribbean Drive
Sunnyvale, CA 94086
(408)745-1655

Commodore 64 Word Processor

Professional Software has released *WordPro 3 Plus/64*, a word processor for the Commodore 64. Described as an easy-to-use, commercial-level word processor, *WordPro 3 Plus/64* includes auto page numbering, headers and footers, math functions, global search and replace, underlining, boldfacing, superscripts and subscripts.

WordPro 3 Plus/64, selling for $89.95, joins the more than 30,000 copies of other WordPro word processing packages already in use worldwide.

Professional Software, Inc.
51 Fremont Street
Needham, MA 02194
(617)444-5224

Graphics Editor For VIC And 64

A machine language graphics editor for the VIC-20 and Commodore 64, *Colorcraft*, has been introduced by Sim Computer Products. *Colorcraft* allows you to create designs using the

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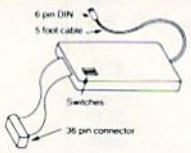

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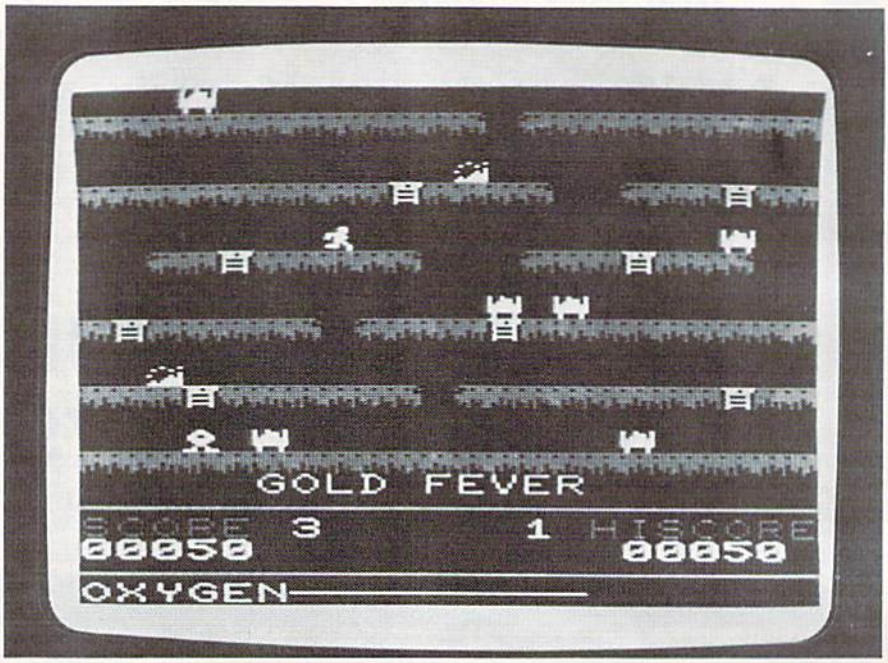
graphics and color keys on the Commodore keyboards. The designs can be copied, edited, and run back-to-back in the form of an electronic flipbook, making you an animator in your own home.

Colorcraft for the 64 is available on disk for $34.95, or cassette for $29.95. The VIC-20 cassette version is $24.95.

Sim Computer Products, Inc.
P.O. Box 7
Miquon, PA 19452

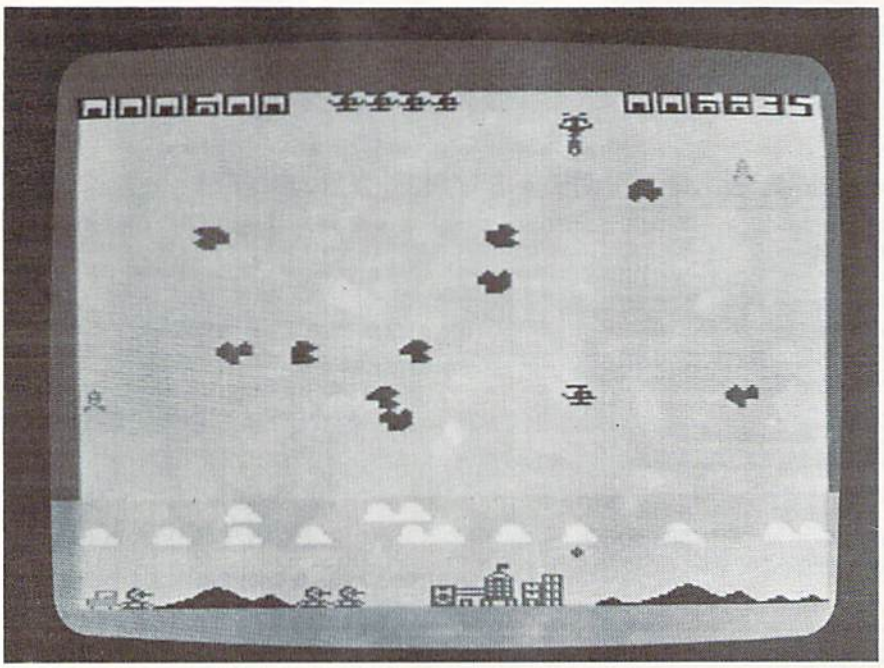


Gold Fever

Three Games For VIC

Tronix Publishing has introduced three new fast-action video games for the Commodore VIC-20.

Deadly Skies is a "shoot-'em-up" game in which the player, equipped with a squadron of five helicopters, tries to destroy an enemy military base.



Deadly Skies

Each sophisticated, highly maneuverable helicopter must be alert to such enemy weapons as ground fire missiles, which shoot straight out of the cloud layer; smart bombs, which track the sky seeking the helicopter; asteroids, which dart around the skies; and UFOs, which travel through the upper atmosphere dropping bombs.

Deadly Skies features 32 play levels. As each of the first 16 levels is played, additional objects enter the screen, making each level more difficult. As the player progresses to the top 16 skill levels, action is twice as fast as at lower levels.

In *Gold Fever!*, the player is a gold miner who must gather gold in a mine shaft while

VIC-20 Users: You're Not Alone Anymore!

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Radar Rat Race	29.95	23.96	3.00
GORF	39.95	31.96	4.00
Raid on Fort Knox	29.95	23.96	3.00
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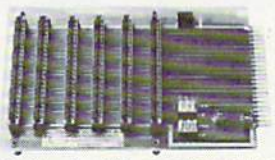

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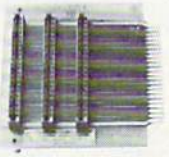

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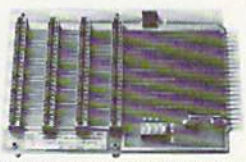

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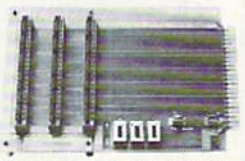

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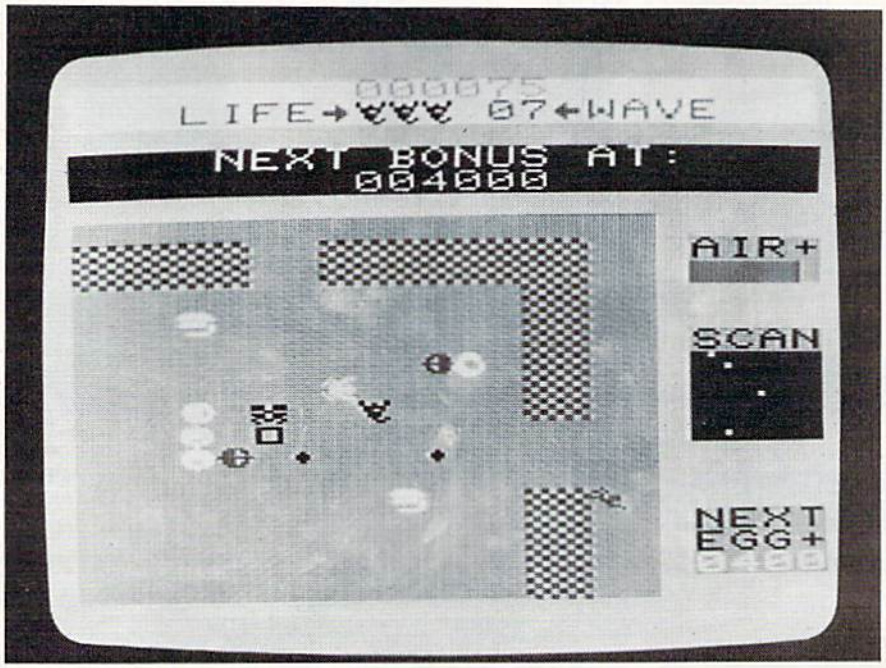

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New Programs For Commodore 64

Three new programs for the Commodore 64, the *Arcade Pak, Game Pak,* and the *Ed-U-Pak* are now available from ComputerMat.

The *Arcade Pak* challenges the players with three high-resolution arcade games: Alien Invasion can be played with one to four players; Head-On pits you against the computer car in a maze race for time; and Target Command challenges you to protect the cities against attacks from space. The *Arcade Pak* is priced at $24.95 for tape, $29.95 for disk.

The *Game Pak* includes three maze and strategy games. In Dragon Chase you race against the dragon through several mazes. Flip-It is a 200-year-old strategy game that has a way of turning the tables on you. Deflect puts you in the driver's seat as you hit selected objects. The price is $14.95 for tape.

The *Ed-U-Pak* contains four programs. Ruler puts you in charge of a country and lets you rule as long as you can. Micro lets you try to make a million by running a computer manufacturing plant. Dungeon of Mathacos is an adventure that has you searching for treasure and answering math problems. In Geography, you match locations around the world and in the United States. The cost is $24.95 for cassette.

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Software Converted For Commodore 64

Spinnaker Software is making its entire line of educational and entertainment game programs available for the Commodore 64.

Six games are available for the 64. They are: *Facemaker, Story Machine, In Search Of The Most Amazing Thing, Hi Diddle Diddle,* and *Snooper Troops I & II.*

Spinnaker also intends to introduce new products for the VIC-20 and Texas Instruments computers in the near future.

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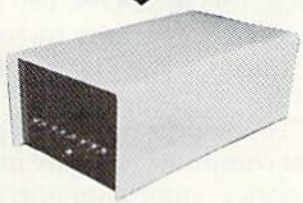

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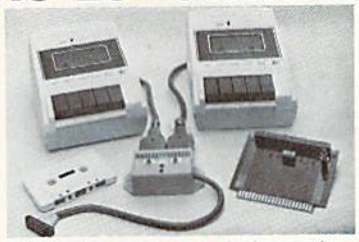

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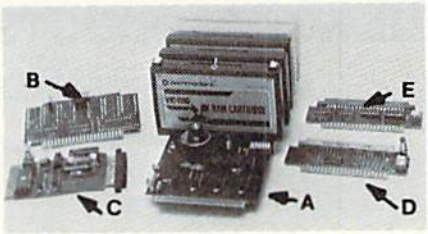

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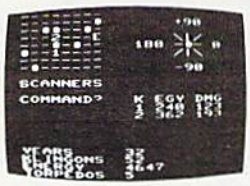

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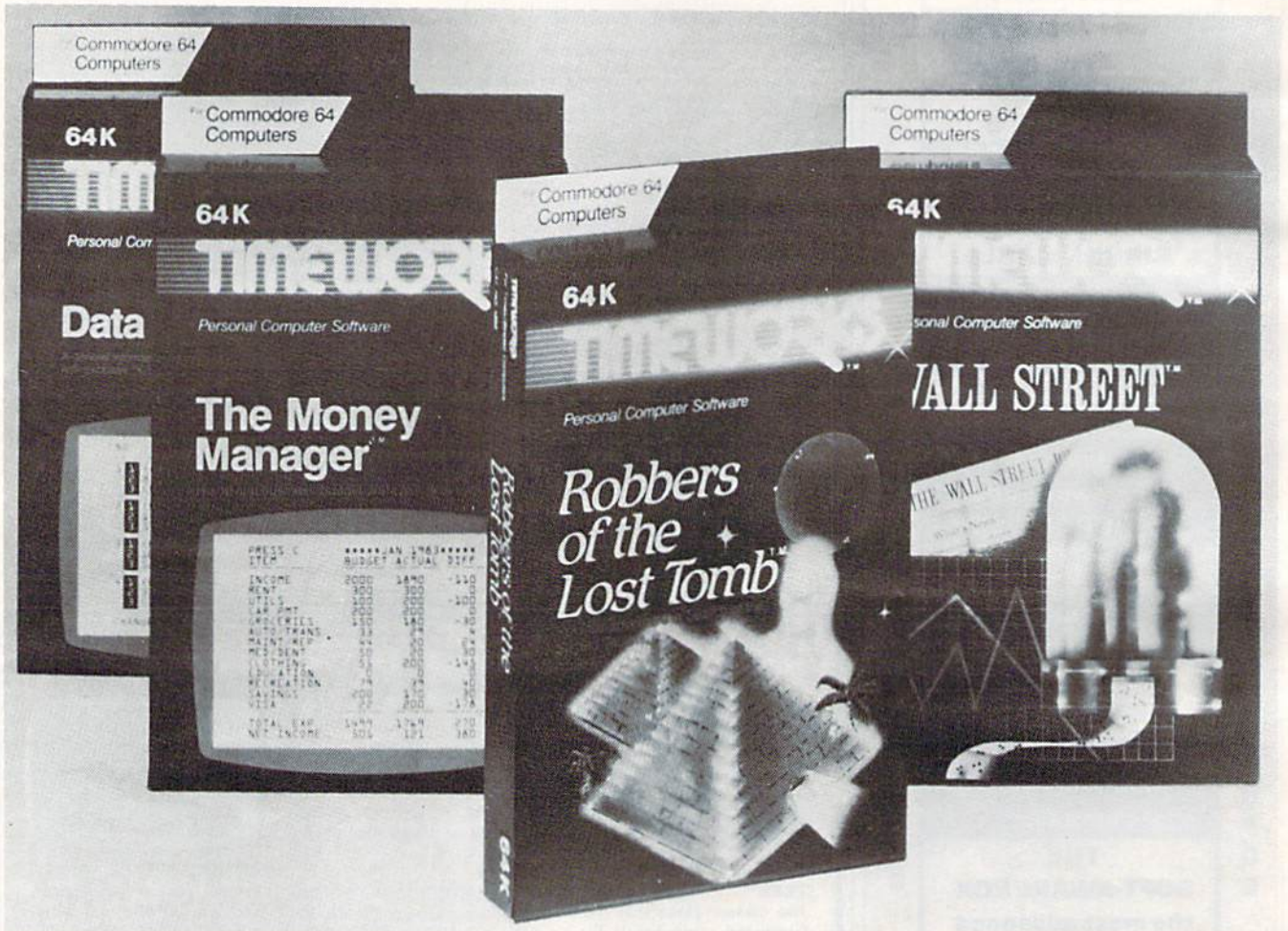

Four new programs for the Commodore 64 from Timeworks, Inc.

Eleven Commodore 64 Programs

Eleven new programs for the Commodore 64 are being introduced nationally by Timeworks, Inc., independent publisher of personal computer software. The first four of these programs which are now available are *Wall Street*, a competitive game of financial speculation; *Robbers of the Lost Tomb*, an adventure search for the Sacred Tablets from a lost 100-room Egyptian tomb; *The Money Manager*, a home and business budget and cash flow system; and *Data Manager*, a general information storage and retrieval system with features usually found in much more expensive programs.

Timeworks's new Commodore 64 programs come with complete and comprehensive, yet easy-to-understand manuals; are simple to operate, and are complete with sound effects and color. They are available on both cassette and disk.

Suggested retail prices range from $21.95 to $29.95. The balance of the programs are to be introduced at the rate of four per month.

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Attention Users Groups

COMPUTE!'s Gazette is compiling a nationwide guide of VIC-20 and Commodore 64 users groups which will be published periodically. Please send us your group's name, address, the name of a contact person, and a phone number (optional). Also include any other relevant information: the group's membership, when it was founded, whether it operates a phone-in bulletin board system for modem users, etc.

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Home And Business Software For The 64

Quick Brown Fox, developer of word processing programs for the Commodore 64 and VIC-20, has announced a line of home and business software for the Commodore 64.

The products are:

- *QuickSpell*, a spelling-checker for the Quick Brown Fox word processor;
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- *QuickMail*, a program for generating and sorting mailing lists for home or business use.

Quick Brown Fox
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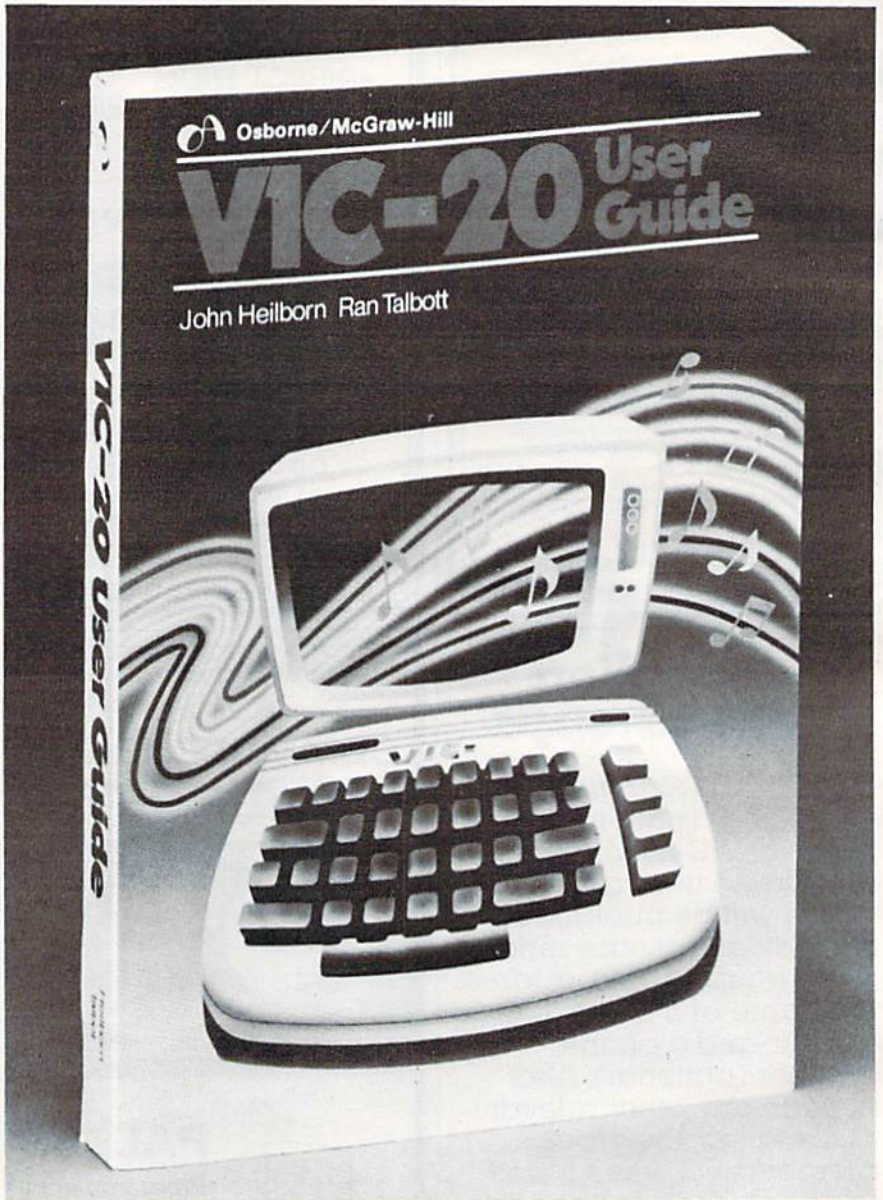
VIC-20 Guide

Osborne/McGraw-Hill has released a handbook for users and potential buyers of Commodore's VIC-20. Written by John Heilborn with Ran Talbott, the *VIC-20 User Guide* addresses users at all levels of computing ability.

For those who use commercial software, the authors provide operating instructions for this computer and its peripherals, including disk drives, printers, and modems. For beginning programmers, there are tutorials in VIC-20 BASIC, including instructions for color graphics and sound. For experienced programmers, this book serves as a reference manual and includes detailed coverage of VIC-20 BASIC statements and functions, including a chapter on advanced color graphics.



The VIC-20 User Guide.

Appendices in the $14.95 book offer information on trigonometric functions, system architecture, a complete memory map, tables, charts, and illustrations.

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The 112-page book was written by C. W. Engle.

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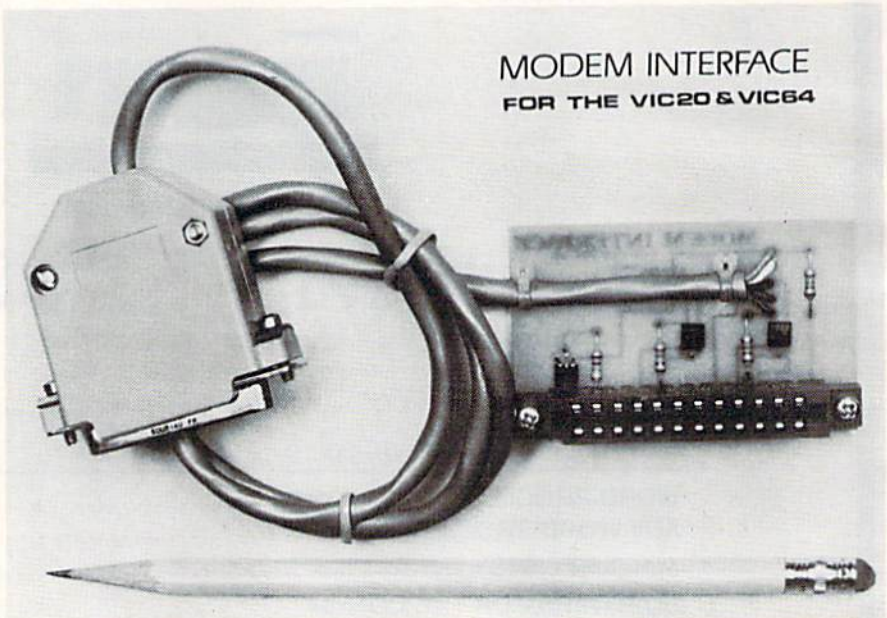

The Modem Interface allows the VIC-20 and Commodore 64 to operate with any standard modem.

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The Modem Interface offers VIC-20 and Commodore 64 users the cost-saving convenience of connecting virtually any modem to their computers. The Modem Interface is compatible with the Microconnection, Hayes Smartmodem, Novation CAT, etc. A three-foot cable with a standard DB25 connector is included. The Modem Interface allows use of your modem's auto-dial/auto-answer features. Included with the Modem Interface is an auto-dial terminal program. The cost is $21.95 postpaid in the U.S., Canada, or Mexico.

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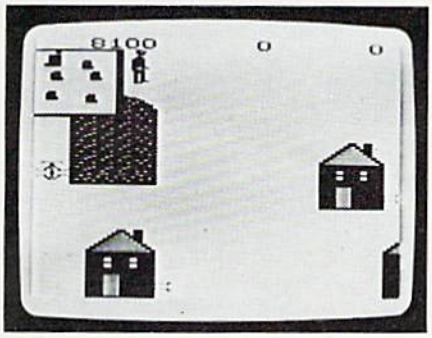
Cartridge Programs For VIC-20 And 64

Creative Software has released three new cartridges for the VIC-20 and Commodore 64.

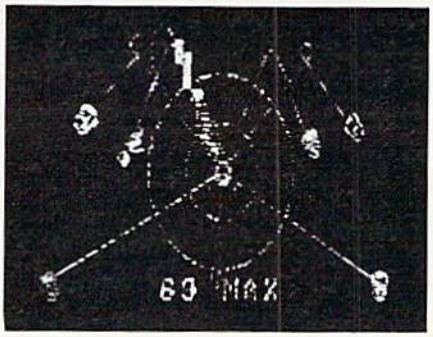
Rat Hotel is an arcade-style, "hide-and-seek" game for the VIC-20 in which the player takes the role of Ermine the Rat, a cheese-seeking inhabitant of the Hotel Paradisio who is pursued by Waldo the Maintenance Man.

Using a joystick, the player maneuvers the Rat from the attic, down six floors and into the basement where he can eat Le Grand Cheeseball. The Rat must reach the basement within three minutes. Reaching the cheese at the very bottom enables the player to reach the next difficulty level. There are five levels in the

Rat Hotel *for the VIC-20.*



Pipes *for the VIC-20.*



Moondust *for the Commodore 64.*

game.

Tension is created when the Rat encounters the various obstacles in his path. The elevators that allow the Rat to move down each floor will stop for him only if he has eaten all the cheese on the floor he wishes to leave. The cheese, depending on color, will either give the Rat energizing points or leave him paralyzed for a few seconds. In addition, traps are strategically placed in the Rat's favorite dining spots and hiding places.

The second new cartridge is *Pipes*, a home education program for the VIC-20. Designed and written by John Doering, *Pipes* is the first in a series of programs intended to join the worlds of education and games. *Pipes* plays like a game while teaching the concepts of spatial relationships and economics.

The object of *Pipes* is to connect all the houses in town to the main water supply. A joystick is used to direct Arlo the Plumber from the factory where he carefully selects the right pipe to the work-site where he installs it. Arlo can select elbow-joints, T-joints, and valves, each with differing dollar values and inventory limitations, to create a cost-effective and efficient water system. If the pipes are not connected and sealed properly, leaks will spring and the game will end. The challenge of *Pipes* is to connect all the houses without running out of the right kind of pipe or using too much money.

Pipes, now available for the VIC-20, will be available for the Commodore 64 in August.

The third new cartridge is *Moondust* by Jaron Lanier, a science-fantasy game for the Commodore 64.

Moondust challenges the player to draw colorful trails of moondust crystals through the heart of glowing concentric circles. It is a true computer game utilizing a full range of sound and color capability. Music, composed according to joystick movement, accompanies every action.

Moondust features the friendly Spacewalker, who is the master painter for the Moondust Fleet. The game begins when he drops moondust to be spread across the screen. Depending upon how far away from the center the moondust is dropped, a certain number of possible points will appear on the screen. The Spacewalker directs his colorful fleet to drag the moondust toward the center. As they whirl around the screen, they leave trails of aqua, emerald green, cobalt, coral, and purple. The player has to watch for the fleet's flying patterns in order to protect the Spacewalker from being bumped three times and ending the game.

Suggested retail price for all the cartridges is $39.95.

Creative Software
230 East Caribbean Drive
Sunnyvale, CA 94086

COMPUTE!'s Gazette *for Commodore welcomes announcements of new products for VIC-20 and Commodore 64 computers, especially products aimed at beginning to intermediate users. Please send press releases and photos well in advance to: Tony Roberts, Assistant Managing Editor,* COMPUTE!'s Gazette, *P.O. Box 5406, Greensboro, NC 27403.*

New product releases are selected from submissions for reasons of timeliness, available space, and general interest to our readers. We regret that we are unable to select all new product submissions for publication. Readers should be aware that we present here some edited version of material submitted by vendors and are unable to vouch for its accuracy at time of publication.

A Beginner's Guide To Typing In Programs

What Is A Program?

A computer cannot perform any task by itself. Like a car without gas, a computer has *potential*, but without a program, it isn't going anywhere. Most of the programs published in *COMPUTE!'s Gazette* for Commodore are written in a computer language called BASIC. BASIC is easy to learn and is built into all VIC-20s and Commodore 64s.

BASIC Programs

Each month, *COMPUTE!'s Gazette* for Commodore publishes programs for both the VIC and 64. To start out, type in only programs written for your machine, e.g., "VIC Version" if you have a VIC-20. Later, when you gain experience with your computer's BASIC, you can try typing in and converting certain programs from another computer to yours.

Computers can be picky. Unlike the English language, which is full of ambiguities, BASIC usually has only one "right way" of stating something. Every letter, character, or number is significant. A common mistake is substituting a letter such as "O" for the numeral "0", a lowercase "l" for the numeral "1", or an uppercase "B" for the numeral "8". Also, you must enter all punctuation such as colons and commas just as they appear in the magazine. Spacing can be important. To be safe, type in the listings *exactly* as they appear.

Brackets And Special Characters

The exception to this typing rule is when you see the curved bracket, such as "{DOWN}". Anything within a set of brackets is a special character or characters that cannot easily be listed on a printer. When you come across such a special statement, refer to "How To Type In *COMPUTE!'s Gazette* Programs."

About DATA Statements

Some programs contain a section or sections of DATA statements. These lines provide information needed by the program. Some DATA statements contain actual programs (called machine language); others contain graphics codes. These lines are especially sensitive to errors.

If a single number in any one DATA statement is mistyped, your machine could "lock up," or "crash." The keyboard and STOP key may seem "dead," and the screen may go blank. Don't panic – no damage is done. To regain control, you have to turn off your computer, then turn it back on. This will erase whatever program was in memory, *so always SAVE a copy of your program before you RUN it*. If your computer crashes, you can LOAD the program and look for your mistake.

Sometimes a mistyped DATA statement will cause an error message when the program is RUN. The error message may refer to the program line that READs the data. *The error is still in the DATA statements, though.*

Get To Know Your Machine

You should familiarize yourself with your computer before attempting to type in a program. Learn the statements you use to store and retrieve programs from tape or disk. You'll want to save a copy of your program, so that you won't have to type it in every time you want to use it. Learn to use your machine's editing functions. How do you change a line if you made a mistake? You can always retype the line, but you at least need to know how to backspace. Do you know how to enter inverse video, lowercase, and control characters? It's all explained in your computer's manuals.

A Quick Review

1) Type in the program a line at a time, in order. Press RETURN at the end of each line. Use backspace or the back arrow to correct mistakes.

2) Check the line you've typed against the line in the magazine. You can check the entire program again if you get an error when you RUN the program.

3) Make sure you've entered statements in brackets as the appropriate control key (see "How To Type *COMPUTE!'s Gazette* Programs" elsewhere in the magazine.)

We regret that we are not able to respond to individual inquiries about programs, products, or services appearing in COMPUTE!'s Gazette *for Commodore due to increasing publication activity. On those infrequent occasions when a published program contains a typo, the correction will appear in the magazine, usually within eight weeks. If you have specific questions about items or programs which you've seen in* COMPUTE!'s Gazette *for Commodore, please send them to Gazette Feedback, P.O. Box 5406, Greensboro, NC 27403.*

How To Type In *COMPUTE!'s Gazette* Programs

Many of the programs which are listed in *COMPUTE!'s Gazette* contain special control characters (cursor control, color keys, inverse video, etc.). To make it easy to know exactly what to type when entering one of these programs into your computer, we have established the following listing conventions.

Generally, any VIC-20 or Commodore 64 program listings will contain bracketed words which spell out any special characters: {DOWN} would mean to press the cursor down key. {5 SPACES} would mean to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing the other key), the key would be underlined in our listings. For example, S would mean to type the S key while holding the shift key. This would appear on your screen as a "heart" symbol. If you find an underlined key enclosed in braces (e.g., {10 N}), you should type the key as many times as indicated (in our example, you would enter ten shifted N's).

If a key is enclosed in special brackets, ⟦⟧, you should hold down the *Commodore key* while pressing the key inside the special brackets. (The Commodore key is the key in the lower left corner of the keyboard.) Again, if the key is preceded by a number, you should press the key as many times as necessary.

Rarely, you'll see a solitary letter of the alphabet enclosed in braces. These characters can be entered on the Commodore 64 by holding down the CTRL key while typing the letter in the braces. For example, {A} would indicate that you should press CTRL-A. You should never have to enter such a character on the VIC-20, but if you do, you would have to leave the quote mode (press RETURN and cursor back up to the position where the control character should go), press CTRL-9 (RVS ON), the letter in braces, and then CTRL-0 (RVS OFF).

About the *quote mode*: you know that you can move the cursor around the screen with the CRSR keys. Sometimes a programmer will want to move the cursor under program control. That's why you see all the {LEFT}'s, {HOME}'s, and {BLU}'s in our programs. The only way the computer can tell the difference between direct and programmed cursor control is the quote mode.

Once you press the quote (the double quote, SHIFT-2), you are in the quote mode. If you type something and then try to change it by moving the cursor left, you'll only get a bunch of reverse-video lines. These are the symbols for cursor left. The only editing key that isn't programmable is the DEL key; you can still use DEL to back up and edit the line. Once you type another quote, you are out of quote mode.

You also go into quote mode when you INSerT spaces into a line. In any case, the easiest way to get out of quote mode is to just press RETURN. You'll then be out of quote mode and you can cursor up to the mistyped line and fix it.

Use the following table when entering cursor and color control keys:

When You Read:	Press:	See:	When You Read:	Press:	See:	When You Read:	Press:	See:
{CLEAR}	SHIFT CLR/HOME		{CYN}	CTRL 4		⟦7⟧	C 7	
{HOME}	CLR/HOME		{PUR}	CTRL 5		⟦8⟧	C 8	
{UP}	SHIFT ↑ CRSR ↓		{GRN}	CTRL 6		{F1}	f1	
{DOWN}	↑ CRSR ↓		{BLU}	CTRL 7		{F2}	f2	
{LEFT}	SHIFT ← CRSR →		{YEL}	CTRL 8		{F3}	f3	
{RIGHT}	← CRSR →		⟦1⟧	C 1		{F4}	f4	
{RVS}	CTRL 9		⟦2⟧	C 2		{F5}	f5	
{OFF}	CTRL 0		⟦3⟧	C 3		{F6}	f6	
{BLK}	CTRL 1		⟦4⟧	C 4		{F7}	f7	
{WHT}	CTRL 2		⟦5⟧	C 5		{F8}	f8	
{RED}	CTRL 3		⟦6⟧	C 6				

Enlivening Programs With Sound

ATTENTION PROGRAMMERS

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs" and "A Beginner's Guide To Typing In Programs" that appear before the Program Listings.

Program 1: Fanfare For 64

```
10 REM:MUSIC PROGRAM FOR 64
20 BEGIN=54272:FORCLEAR=BEGTOBEGIN+24:POK
   ECLEAR,0:NEXT
30 POKEBE+5,85:POKEBE+6,85:POKEBE+12,85:P
   OKEBE+13,85
40 POKEBE+24,15
50 POKEBE+4,33:POKEBE+11,17
60 FORX=1TO6:READH1,L1,H2,L2:POKEBE+1,H1:
   POKEBE,L1:POKEBE+8,H2:POKEBE+7,L2

65 IFH1=50THENFORT=1TO200:NEXT
70 FORT=1TO100:NEXT
80 DATA25,30,18,209,33,135,25,30,42,62,31
   ,165,50,60,37,162,42,62,31,165,50
   ,60
85 DATA37,162
90 NEXTX
100 BEGIN=54272:FORCLEAR=BEGTOBEGIN+24:POK
   ECLEAR,0:NEXT
```

Program 2: Fanfare For VIC

```
0 REM:FANFARE FOR VIC
10 S1=36876
20 S2=36875
30 V=36878
40 POKEV,15
50 FORX=1TO6:READP1,P2:POKES1,P1:POKES2,P
   2
60 FORT=1TO150:NEXT
65 IFP1=235THENFORT=1TO200:NEXT
68 NEXT
70 POKEV,0
80 DATA215,215,225,225,231,231,235,235,23
   1,231,235,235
```

The Beginner's Corner

Graphics With PRINT

```
10 PRINT"{CLR}{2 DOWN}"
20 PRINTTAB(18);"{YEL}Q{DOWN}"
30 PRINTTAB(9);"{CYN}U{DOWN}{2 LEFT}
   U{DOWN}{2 LEFT}U"
40 PRINTTAB(7);"£-3"
50 PRINTTAB(5);"{GRN}{RVS}B
   £*3{OFF}{CYN}£-3"
60 PRINTTAB(4);"{GRN}{RVS}B
   {2 SPACES}£*3"
70 PRINT"{3 SPACES}{RVS}B
   {4 SPACES}£*3"
80 PRINT"{4 SPACES}{RED}£4 +3"
90 PRINT"{4 SPACES}£4 +3"
100 PRINT"{4 SPACES}£+3{BLK}
    £2 B3{RED}£+3"
110 PRINT"{4 SPACES}£+3{BLK}
    £2 B3{RED}£+3"
120 PRINT"{4 SPACES}£+3{BLK}
    £2 B3{RED}£+3"
130 PRINT"{GRN}£22 E3{BLU}"
140 GOTO 140
150 END

 UNDERLINE = SHIFT,
 £ 3 = COMMODORE KEY,
 { }= SPECIAL.
 REFER TO LISTING CONVENTIONS
```

Commodore Classics: Quickfind

Program 1: VIC-20 Quickfind

```
140 N=5:DIM A$(N):REM N IS # OF PROGRAMS
    ON TAPE
150 FOR I=1 TO N:READ A$(I):NEXT I
160 PRINT CHR$(147);CHR$(144);"
    {2 SPACES}PROGRAM":PRINT "NUMBER/NAM
    E":PRINT
170 FOR I=1 TO N:PRINT CHR$(157);I;"
    {2 SPACES}";A$(I):NEXT I:PRINT
180 INPUT "FIND NUMBER";J:PRINT
190 IF J<1 OR J>N THEN 160
200 IF J=1 THEN 330
210 REM START OF FAST FORWARD ROUTINE
220 REM WAIT FOR RELEASE IF NECESSARY
230 IF (PEEK(37151) AND 64)=0 THEN PRINT
    "PRESS STOP ON CASSETTE"
240 IF (PEEK(37151) AND 64)=0 THEN 240
250 PRINT "PRESS FAST FORWARD":PRINT
260 IF (PEEK(37151) AND 64)=64 THEN 260:
    REM CHECK FOR PRESS
270 PRINT "OK":PRINT:A=TI
280 IF ABS(TI-A)<(J-1)*360 THEN 280:REM
    FAST FORWARD 6 SEC PER PROGRAM
290 POKE 37148,PEEK(37148) AND 247:REM S
    TOP MOTOR
300 PRINT "RELEASE FAST FORWARD"
310 IF (PEEK(37151) AND 64)=0 THEN 310:R
    EM WAIT FOR RELEASE
320 REM DYNAMIC KEYBOARD LOAD
330 PRINT CHR$(147);CHR$(17);CHR$(17);CH
    R$(17);"LOAD ";CHR$(34);A$(J);CHR$(3
    4);CHR$(19)
340 POKE 198,1:POKE 631,13:END
```

Attention Young People

COMPUTE!'s Gazette wants to know what today's young people are doing with computers. We want our readers to know, too. If you've written an interesting program for the VIC-20 or Commodore 64, share it with us. See the Author Guide elsewhere in this issue, and tell us your age when you submit an article.

```
350 DATA PROGRAM1,PROGRAM2,PROGRAM3,PROG
    RAM4,PROGRAM5

 UNDERLINE = SHIFT,
 [ ] = COMMODORE KEY,
 { }= SPECIAL.
 REFER TO LISTING CONVENTIONS
```

Program 2: Commodore 64 Quickfind

```
140 N=5:DIM A$(N):REM N IS # OF PROGRAMS O
    N TAPE
150 FOR I=1 TO N:READ A$(I):NEXT
160 PRINT CHR$(147);CHR$(18);"  PROGRAM  "
    :PRINT"NUMBER NAME":PRINT
170 FOR I=1 TO N:PRINT I;"     ";A$(I):NEXT
    :PRINT
180 INPUT "FIND NUMBER";J:PRINT
190 IF J<1 OR N>N THEN 160
200 IF J=1 THEN 330
210 REM START OF ROUTINE TO FAST FORWARD
220 REM WAIT FOR RELEASE IF NECESSARY
230 IF (PEEK(1)AND16)=0  THEN PRINT "PRESS
     STOP ON CASSETTE":PRINT
240 IF (PEEK(1)AND16)=0 THEN 240
250 PRINT "PRESS FAST FORWARD NOW":PRINT
260 IF (PEEK(1)AND16) THEN 260
270 PRINT"OK...SEARCHING":PRINT:A=TI:POKE1
    92,1
280 IF ABS(TI-A)<(J-1)*360 THEN 280:REM FA
    ST FORWARD 6 SEC PER PROGRAM
290 POKE1,(PEEK(1)OR32):REM STOP MOTOR
300 PRINT"PRESS STOP ON CASSETTE"
310 IF (PEEK(1)AND16)=0 THEN 310
320 REM DYNAMIC KEYBOARD LOAD
330 PRINTCHR$(147);CHR$(17);CHR$(17);CHR$(
    17);
335 PRINT"LOAD ";CHR$(34);A$(J);CHR$(34);C
    HR$(19)
340 POKE 198,1:POKE 631,13:END
350 DATA PROGRAM1,PROGRAM2,PROGRAM3,PROGRA
    M4,PROGRAM5
```

Skydiver

ATTENTION PROGRAMMERS

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs" and "A Beginner's Guide To Typing In Programs" that appear before the Program Listings.

Program 1: VIC-20 Version

```
8 P1=37151:P2=37152:P3=37154:T7=30720:NE
  =2
10 PRINT"{CLR}":GOTO60100
12 A(1)=7772:A(2)=7778:A(3)=7782
14 SC=0:BO=100:BA=3:WA=7:W=8:EX=0
16 PRINT"{HOME}SCORE: 000{3 SPACES}"
20 GOSUB5000
21 PRINT"{HOME}";TAB(14);"{3 SPACES}
   {3 LEFT}";A$
22 CT=21+INT(RND(TI)*20+1):CC=0
30 A=0

100 PRINT"{HOME}{DOWN}";TAB(A);"{OFF}
    {RVS}[*]{2 LEFT}{DOWN}{OFF}
    {RVS}[2 I]":A=A+1

102 CC=CC+1:IFCC>=CT ANDA<21ANDA>1THEN12
    0
105 IFA>=20THENPRINT"{HOME}{DOWN}";TAB(A
    );" {DOWN}{LEFT}{2 SPACES}":A=0
110 GOSUB 1000:IFR<>128THENFORI=1TO50:NE
    XT:GOTO100

112 IFA>20ORA<1THEN100
120 PRINT"{HOME}{DOWN}";TAB(A);" {LEFT}
    {DOWN}{2 SPACES}"
200 B=7747+A:T=INT(RND(TI)*8+1):T=T+1
210 CH=46:C=0

212 C=C+1
220 POKEB,CH:POKEB,32:B=B+22
230 POKEB+T7,4:POKEB,CH:IFC<TTHENFORY=1T
    O80:NEXT:GOTO212
300 CH=65
305 POKEB+T7,4:POKEB,CH
310 GOSUB1000:C=C+1
320 IFC>=WTHENIFR=4THENPOKEB,32:B=B-1:PO
    KEB+T7,4:POKEB,CH:C=0

330 IFC>=WTHENIFR=8THENPOKEB,32:B=B+1:PO
    KEB+T7,4:POKEB,CH:C=0
340 D=D+1
350 IFD>=WATHENPOKEB,32:B=B+22
355 IFD>=WATHEND=0:IFPEEK(B)<>32THEN3000
360 POKEB+T7,4:POKEB,CH
370 WI=WI+1
390 IFWI>=SANDDI=-1THENPOKEB,32:B=B+DI:P
    OKEB+T7,4:WI=0

395 IFWI>=SANDDI=1THENPOKEB,32:B=B+DI:PO
    KEB+T7,4:WI=0
400 IFPEEK(B)<>32ANDPEEK(B)<>CHTHEN3000
410 POKEB,CH
500 GOTO300
1000 POKEP3,127:X=NOTPEEK(P1)AND60-((PEE
     K(P2)AND128)=0):POKEP3,255
1010 R=-((XAND4)=4)-2*((XAND8)=8)-4*((XA
     ND16)=16)-8*((XAND1)=1)-128*((XAND3
     2)=32)

1020 RETURN
3000 POKEB+T7,4
3010 IFP=1THENIFB=8124ORB=8125THENPOKEB,
     CH:GOTO4000
3020 IFP=2THENIFB=8130THENPOKEB,CH:GOTO4
     050
3030 IFP=3THENIFB=8135ORB=8136ORB=8137TH
     ENPOKEB,CH:GOTO4100
3040 POKEB,170:GOTO12000
4000 PRINT"{HOME}{8 DOWN}{5 RIGHT}5 X";B
     O;"=";5*BO
4010 VA=5*BO:GOTO10000
4050 PRINT"{HOME}{8 DOWN}{4 RIGHT}10 X";
     BO;"=";10*BO
4060 VA=10*BO:GOTO10000
4100 PRINT"{HOME}{8 DOWN}{5 RIGHT}2 X";B
     O;"=";2*BO
4110 VA=2*BO:GOTO10000
5000 PRINT"{HOME}{19 DOWN}"
5020 PRINT"{3 SPACES}{BLK}[L]{YEL}
     [2 I]{BLK}[J]{2 SPACES}
     {BLK}[L]{YEL}[I]{BLK}
     [J]{2 SPACES}[L]{YEL}
     [3 I]{BLK}[J]{BLU}"
5030 PRINT"{RVS}{4 SPACES}5X{3 SPACES}10
     X{4 SPACES}2X{4 SPACES}{OFF}";
5040 FORI=8164TO8185:POKEI+T7,6:POKEI,16
     0:NEXT
5041 IFBA<=0THEN60000
```

```
5042 PRINT"{HOME}";TAB(17);"{4 SPACES}"
5043 IFBA>1THENPRINT"{HOME}";TAB(18);:FO
     RI=1TOBA-1:PRINT"A";:NEXT:PRINT
5045 SS=INT(RND(TI)*3+1):DI=INT(RND(TI)*
     2+1):IFDI=2THENDI=-1
5048 IFSS=1THENS=5:SD=15
5049 IFSS=2THENS=10:SD=10
5050 IFSS=3THENS=15:SD=5
5052 D$="RIGHT":IFDI=-1THEND$="LEFT"
5053 IFNJ>=NETHENBO=BO+50:PRINT"{HOME}
     {7 DOWN}BONUS ADVANCE TO{RED}";BO:P
     RINT"{BLU}"
5054 IFNJ>=NETHENIFWA>4THENWA=WA-1
5055 IFNJ>=NETHENNJ=0:IFW<18THENW=W+1
5056 PRINT"{HOME}{2 DOWN}";TAB(3);"WIND:
     ";SD"TO ";D$:GOSUB50000
5057 FORK=1TO1000:NEXT:PRINT"{HOME}
     {DOWN}{20 SPACES}"
5060 FORI=7724TO8141STEP22:POKEI,96:POKE
     I+21,96:NEXT
5070 RETURN
10000 JM=JM+1:NJ=NJ+1
10100 FORP=1TOVA/10:PRINT"{HOME}{BLU}SCO
      RE:{RED}";SC:POKES3,0:SC=SC+10:NEX
      T:PRINT"{HOME}{BLU}SCORE:{RED}";SC
10110 FORID=1TO1000:NEXT:IFEX=0ANDSC>=50
      00THENBA=BA+1:EX=1
10120 PRINT"{HOME}{8 DOWN}{21 SPACES}":G
      OTO20
12000 PRINT"{HOME}{8 DOWN}{3 RIGHT}SORRY
       NO BONUS!":BA=BA-1
12010 FORID=1TO500:NEXT
12120 POKEB,32:PRINT"{HOME}{8 DOWN}
      {21 SPACES}":GOTO20
50000 REM SELECTION
50010 PRINT"{HOME}{4 DOWN}{RED}
      {4 SPACES}5X{3 SPACES}10X
      {2 SPACES}2X{BLU}":P=1:Z=P
50020 TI$="000000"
50025 POKEA(P),PEEK(A(P))+128AND255
50027 TM=15-VAL(TI$)
50028 PRINT"{HOME}{12 DOWN}";TAB(10);"
      {2 SPACES}{3 LEFT}";TM:IFTM=0THENP
      =INT(RND(TI)*3+1):GOTO50100
50030 GOSUB1000:IFR=4ORR=8THENX=PEEK(A(P
      )):IFX>129THENPOKEA(P),X+128AND255
50035 IFR>127THEN50100
50040 GOSUB1000:IFR=4THENP=P-1:IFP<1THEN
      P=3
50045 IFR=8THENP=P+1:IFP>3THENP=1
50050 FORID=1TO100:NEXT:GOTO50025
50100 A$="2X":IFP=1THENA$="5X"
50110 IFP=2THENA$="10X"
50120 PRINT"{DOWN} YOU MUST LAND ON ";A$
50140 FORID=1TO1500:NEXT
50150 PRINT"{HOME}":FORID=1TO18:PRINT"
      {21 SPACES}":NEXT:RETURN
60000 PRINT"{HOME}{7 DOWN}{6 RIGHT}GAME
      OVER":IFSC>HITHENHI=SC
60010 FORHD=1TO2000:NEXT
60020 PRINT"{HOME}{7 DOWN}{6 RIGHT}
      {9 SPACES}"
60100 POKE36879,188:PRINT"{HOME}{2 DOWN}
      {6 SPACES}{RED}SKY DIVER"
60110 PRINT:PRINT:PRINT:PRINT
60120 PRINT" {PUR}USE JOYSTICK TO PLAY"
60130 PRINT:PRINT:PRINT:PRINT
60140 PRINT"{6 SPACES}{GRN}HIGH SCORE
      {RED}":PRINT
60150 XX=LEN(STR$(HI))/2:PRINTTAB(10-XX)
      ;HI
60160 GOSUB1000:IFR=0THEN60160
60170 PRINT"{HOME}":FORK=1TO18:PRINT"
      {21 SPACES}":NEXT:GOTO12
```

UNDERLINE = SHIFT,
[ ] = COMMODORE KEY,
{ }= SPECIAL.
REFER TO LISTING CONVENTIONS

Program 2: For VIC With Super Expander

Additions and modifications to Program 1. The ← in lines 12010, 63000, and 63010 indicates CTRL-left arrow.

```
4 REM  SUPER EXPANDER VERSION
6 S1=36874:S2=36875:S3=36876:POKE36878,15
110 IFRJOY(0)<>128THENFORI=1TO50:NEXT:GOTO
     100
310 R=RJOY(0):C=C+1
5053 IFNJ>=NETHENBO=BO+50:PRINT"{HOME}{07
     DOWN}BONUS ADVANCE TO{RED}";BO:PRINT
     "{BLU}":GOSUB 63000
10000 RESTORE:JM=JM+1:NJ=NJ+1
10002 READN,M:IFN=999THEN10100
10004 POKES1,N:POKES2,N:POKES3,N:FORI=1TOM:
     NEXT
10006 POKES3,0:POKES1,0:POKES2,0:FORK=1TO20
     :NEXT:GOTO10002
10100 FORP=1TOVA/10:POKES3,220:PRINT"{HOME}
     {BLU}SCORE:{RED}";SC:POKES3,0:NEXT:
     PRINT"{HOME}{BLU}SCORE:{RED}";SC
10110 FORID=1TO2000:NEXT:IFEX=0ANDSC>=5000
     THENBA=BA+1:EX=1
12010 PRINT"{←}3T2GRT1DT0RT1DRT3ERDRT3R#FR
     G"
25000 DATA 217,400,213,400,223,400,227,200
     ,234,200,230,400,227,200,234,200,230,
     400
25020 DATA 223,400,227,400,217,400,213,400
     ,236,400,234,1000,999,0
50030 R=RJOY(0):IFR=4ORR=8THENX=PEEK(A(P)):
     IFX>129THENPOKEA(P),X+128AND255
50040 IFRJOY(0)=4THENP=P-1:IFP<1THENP=3
50045 IFRJOY(0)=8THENP=P+1:IFP>3THENP=1
60160 IFRJOY(0)=0THEN60160
63000 PRINT"{←}S2T3EFT4GEFDECT5D"
63010 PRINT"{←}S3T3EFT4GEFDECT5DT3"
63020 RETURN
```

Program 3: Commodore 64 Version

```
8 T7=54272: E=2
10 PRINT"{CLR}":GOTO60100
12 A(1)=1192:A(2)=1202:A(3)=1209
14 SC=0:BO=100:BA=3:WA=7:W=8:EX=0
16 PRINT"{HOME}{2 DOWN}{3 RIGHT}SCORE: 0
   00{3 SPACES}"
20 GOSUB5000
21 PRINT"{HOME}{2 DOWN}{3 RIGHT}";TAB(14
   );"{3 SPACES}{3 LEFT}";A$
22 CT=39+INT(RND(TI)*20+1):CC=0
30 A=0
100 PRINT"{HOME}{DOWN}";TAB(A);"{OFF}
    {RVS}[*]{2 LEFT}{DOWN}{OFF}
    {RVS}[2 I]":A=A+1
102 CC=CC+1:IFCC>=CT ANDA<39ANDA>1THEN12
    0
105 IFA>=38THENPRINT"{HOME}{DOWN}";TAB(A
    );" {DOWN}{LEFT}{2 SPACES}":A=0
110 GOSUB 1000:IFFR<>0THENFORI=1TO50:NEX
```

```
    T:GOTO100
112 IFA>380RA<1THEN100
120 PRINT"{HOME}{DOWN}";TAB(A);" {LEFT}
    {DOWN}{2 SPACES}"
200 B=1146+A:T=INT(RND(TI)*8+1):T=T+1
210 CH=46:C=0
212 C=C+1
220 POKEB,CH:POKEB,32:B=B+22
230 POKEB+T7,4:POKEB,CH:IFC<TTHENFORY=1T
    O80:NEXT:GOTO212
300 CH=65
305 POKEB+T7,4:POKEB,CH
310 GOSUB1000:C=C+1
320 IFC>=WTHENIFR=4THENPOKEB,32:B=B-1:PO
    KEB+T7,4:POKEB,CH:C=0
330 IFC>=WTHENIFR=8THENPOKEB,32:B=B+1:PO
    KEB+T7,4:POKEB,CH:C=0
340 D=D+1
350 IFD>=WATHENPOKEB,32:B=B+40
355 IFD>=WATHEND=0:IFPEEK(B)<>32THEN3000
360 POKEB+T7,4:POKEB,CH
370 WI=WI+1
390 IFWI>=SANDDI=-1THENPOKEB,32:B=B+DI:P
    OKEB+T7,4:WI=0
395 IFWI>=SANDDI=1THENPOKEB,32:B=B+DI:PO
    KEB+T7,4:WI=0
400 IFPEEK(B)<>32ANDPEEK(B)<>CHTHEN3000
410 POKEB,CH
500 GOTO300
1000 R=PEEK(56321)
1010 FR=RAND16
1020 R=15-(RAND15):RETURN
3000 POKEB+T7,4
3010 IFP=1THENIFB=1831ORB=1832THENPOKEB,
     CH:GOTO4000
3020 IFP=2THENIFB=1842THENPOKEB,CH:GOTO4
     050
3030 IFP=3THENIFB=1851ORB=1853ORB=1855TH
     ENPOKEB,CH:GOTO4100
3040 POKEB,170:GOTO12000
4000 PRINT"{HOME}{8 DOWN}{11 RIGHT}5 X";
     BO;"=";5*BO
4010 VA=5*BO:GOTO10000
4050 PRINT"{HOME}{8 DOWN}{9 RIGHT}10 X";
     BO;"=";10*BO
4060 VA=10*BO:GOTO10000
4100 PRINT"{HOME}{8 DOWN}{11 RIGHT}2 X";
     BO;"=";2*BO
4110 VA=2*BO:GOTO10000
5000 PRINT"{HOME}{19 DOWN}"
5020 PRINT"{6 SPACES}{BLK}{L}{YEL}
     {4 I}{BLK}{J}{5 SPACES}
     {BLK}{L}{YEL}{3 I}{BLK}
     {J}{7 SPACES}{L}{YEL}
     {5 I}{BLK}{J}{BLU}"
5030 PRINT"{RVS}{8 SPACES}5X{9 SPACES}10
     X{10 SPACES}2X{6 SPACES}{OFF}";
5040 FORI=1984TO2023:POKEI+T7,6:POKEI,16
     0:NEXT
5041 IFBA<=0THEN60000
5042 PRINT"{HOME}";TAB(17);"{4 SPACES}"
5043 IFBA>1THENPRINT"{4 DOWN}{HOME}";TAB
     (18);:FORI=1TOBA-1:PRINT"A";:NE
     XT:PRINT
5045 SS=INT(RND(TI)*3+1):DI=INT(RND(TI)*
     2+1):IFDI=2THENDI=-1
5048 IFSS=1THENS=5:SD=15
5049 IFSS=2THENS=10:SD=10
5050 IFSS=3THENS=15:SD=5
5052 D$="RIGHT":IFDI=-1THEND$="LEFT"
5053 IFNJ>=NETHENBO=BO+50:PRINT"{HOME}
     {5 RIGHT}{7 DOWN}BONUS ADVANCE TO
     {RED}";BO:PRINT"{BLU}"
5054 IFNJ>=NETHENIFWA>4THENWA=WA-1
5055 IFNJ>=NETHENNJ=0:IFW<18THENW=W+1
5056 PRINT"{HOME}{5 DOWN}";TAB(8);"WIND:
     ";SD"TO ";D$:GOSUB50000
5057 FORK=1TO1000:NEXT:PRINT"{HOME}
     {DOWN}{20 SPACES}"
5060 FORI=1104TO1864STEP40:POKEI,96:POKE
     I+39,96:NEXT
5070 RETURN
10000 JM=JM+1:NJ=NJ+1
10100 FORP=1TOVA/10:PRINT"{HOME}{BLU}SCO
      RE:{RED}";SC:POKES3,0:SC=SC+10:NEX
      T:PRINT"{HOME}{BLU}SCORE:{RED}";
10110 FORID=1TO1000:NEXT:IFEX=0ANDSC>=50
      00THENBA=BA+1:EX=1
10120 PRINT"{HOME}{8 DOWN}{21 SPACES}":G
      OTO20
12000 PRINT"{HOME}{8 DOWN}{3 RIGHT}SORRY
       NO BONUS!":BA=BA-1
12010 FORID=1TO500:NEXT
12120 POKEB,32:PRINT"{HOME}{8 DOWN}
      {21 SPACES}":GOTO20
50000 REM SELECTION
50010 PRINT"{HOME}{5 RIGHT}{4 DOWN}{RED}
      {4 SPACES}5X{3 SPACES}10X
      {2 SPACES}2X{BLU}":P=1:Z=P
50020 TI$="000000"
50025 POKEA(P),PEEK(A(P))+128AND255
50027 TM=15-VAL(TI$)
50028 PRINT"{HOME}{12 DOWN}";TAB(10);"
      {2 SPACES}{3 LEFT}";TM:IFTM=0THENP
      =INT(RND(TI)*3+1):GOTO50100
50030 GOSUB1000:IFR=4ORR=8THENX=PEEK(A(P
      )):IFX>129THENPOKEA(P),X+128AND255
50035 IFR>127THEN50100
50040 GOSUB1000:IFR=4THENP=P-1:IFP<1THEN
      P=3
50045 IFR=8THENP=P+1:IFP>3THENP=1
50050 FORID=1TO100:NEXT:GOTO50025
50100 A$="2X":IFP=1THENA$="5X"
50110 IFP=2THENA$="10X"
50120 PRINT"{DOWN} YOU MUST LAND ON ";A$
50140 FORID=1TO1500:NEXT
50150 PRINT"{HOME}":FORID=1TO18:PRINT"
      {30 SPACES}":NEXT:RETURN
60000 PRINT"{HOME}{7 DOWN}{6 RIGHT}GAME
      OVER":IFSC>HITHENHI=SC
60010 FORHD=1TO2000:NEXT
60020 PRINT"{HOME}{7 DOWN}{6 RIGHT}
      {9 SPACES}"
60100 POKE53281,1 :POKE53280,6{3 SPACES}
      :PRINT"{HOME}{4 DOWN}{11 SPACES}
      {BLK} SKY DIVER"
60110 PRINT:PRINT:PRINT"{2 DOWN}"
60120 PRINT"{8 SPACES}{2 BLU}USE JOYSTIC
      K TO PLAY"
60130 PRINT:PRINT:PRINT:PRINT"{2 DOWN}"
60140 PRINT"{12 SPACES}{GRN}HIGH SCORE
      {RED}":PRINT"{2 DOWN}"
60150 XX=LEN(STR$(HI))/2:PRINTTAB(16-XX)
      ;HI
60160 GOSUB1000:IFFR<>0THEN60160
60170 PRINT"{CLR}":FORK=1TO18:PRINT"
      {21 SPACES}":NEXT:GOTO12
```

UNDERLINE = SHIFT,
{ } = COMMODORE KEY,
[ ]= SPECIAL.
REFER TO LISTING CONVENTIONS

Snake Escape

ATTENTION PROGRAMMERS
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Program 1: VIC Version

```
100 SO=0:SR=3:S1=36875:V=36878
110 GOSUB30000:GOSUB29000
120 PRINT"{CLR}"
130 GOSUB28000:GOSUB8000:GOSUB9000:GOSUB
    28000
140 TI$="000000"
150 CL=INT(RND(1)*7)+1:IFCL=5ORCL=3THEN1
    50
160 IFTI$=L$THENGOSUB7000:GOTO130
170 IFDH=0THENPOKEB,HC
180 POKEB,HC:POKECO,CL
190 K=PEEK(197)
200 IFK=20THENDR=-1:GOTO250:REM LEFT
210 IFK=44THENDR=1:GOTO250:REM RIGHT
220 IFK=12THENDR=-22:GOTO250:REM UP
230 IFK=36THENDR=22:GOTO250:REM DOWN
240 GOTO160
250 POKEB,BC:B=B+DR:CO=CO+DR:SO=SO+1
260 IFPEEK(B)=88THENDH=0:GOTO9500
270 IFPEEK(B)=160THENGOSUB5000:GOTO120
280 IFPEEK(B)=81THENGOTO9500
300 IFB<7680ORB>8185THENB=B-DR:CO=CO-DR
310 GOSUB10000:GOTO150
4000 REM PRINT INSTRUCTIONS
4010 PRINT"{CLR}{DOWN}{BLU} YOUR GOAL IS
     TO MOVE{2 SPACES}THE SNAKE OUT OF
     THE{2 SPACES}POISON PATCH."
4020 PRINT"{DOWN}{GRN} TRY TO AVOID ALL
     {6 SPACES}POISON ({BLK}X{CYN}).
     "
4030 PRINT"{DOWN}{RED}CONTROLS:":PRINT"
     {PUR} J={RVS}LEFT":PRINT"{GRN} K=
     {RVS}RIGHT"
4040 PRINT"{CYN} I={RVS}UP":PRINT"{RED}
     M={RVS}DOWN"
4050 PRINT"{DOWN}{RED}POINT VALUES:"
4060 PRINT" {BLU}BODY SEGMENT={RVS}1
     {OFF} POINT"
4070 PRINT"{DOWN}{YEL} YOU WILL RECEIVE
     A{4 SPACES}BONUS FOR ESCAPING."
4080 PRINT"{DOWN}{CYN}{RVS}{RIGHT} HIT A
     KEY TO START "
4090 GETA$:IFA$=""THEN4090
4100 RETURN
5000 VB=0:POKE36879,27
5010 IFS=1THENVB=20
5020 IFS=2THENVB=30
5030 IFS=3THENVB=40
5035 IFS=4THENVB=50
5040 BN=FNSC(VB)
5050 PRINT"{CLR}{6 DOWN}{RIGHT}{BLU}YOU
     HAVE ESCAPED!!!"
5060 SO=SO+BN
5070 PRINT"{2 DOWN}{6 SPACES}{RED}{RVS}B
     ONUS{OFF}:{RVS}{CYN}"BN"{OFF}"
5080 PRINT"{2 DOWN}{6 SPACES}{RVS}{PUR}S
     CORE{OFF}:{RVS}{GRN}"SO
5090 PRINT"{2 DOWN}{RIGHT}{CYN}"SR"{RED}
     SNAKES REMAINING"
5100 FORPI=150TO250STEP5:POKES3,PI:POKEV
     ,15
5110 FORT=1TO50:NEXTT:NEXTPI:POKEV,0:POK
     ES3,0:DH=2
5120 FORT=1TO2000:NEXTT:RETURN
6000 PRINT"{CLR}{10 DOWN}{4 RIGHT}{BLU}
     VVVVVVV
     VVVVVV":PRINT"
     {4 RIGHT}{BLU}V{RVS}{CYN}
     {11 RIGHT}{OFF}{BLU}V"
6005 PRINT"{4 RIGHT}VVVV
     VVVVVVV
     VV"
6010 PRINT"{HOME}{11 DOWN}{5 RIGHT}{RVS}
     {CYN} GAME"
6020 POKEV,15:POKE36874,175:FORT=1TO1000
     :NEXTT
6025 POKE36874,150:PRINT"{HOME}{11 DOWN}
     {10 RIGHT}{RVS}{CYN} OVER ":FORT=1T
     O1000:NEXTT
6030 POKE36874,0:POKEV,0
6040 PRINT"{3 DOWN}{5 RIGHT}{RED}PLAY AG
     AIN ?"
6050 GETP$:IFP$=""THEN6050
6060 IFP$="Y"THENSO=0:SR=3:LK=0:GOTO120
6070 IFP$<>"N"THEN6050
6080 PRINT"{3 DOWN}{9 SPACES}BYE!{HOME}"
     :END
7000 SR=SR-1:POKE36879,27
7010 PRINT"{CLR}"SPC(23)"{CYN}WHEW! YOU
     HAVE JUST{3 SPACES}DIED OF EXAUSTIO
     N!"
7020 PRINTSPC(49)"{RVS}{PUR}SCORE{OFF}:
     {RVS}{GRN}"SO
7030 PRINTSPC(67)"{RED}"SR"{BLU}SNAKES R
     EMAINING"
7040 FORVD=13TO0STEP-1:POKE36874,200:POK
     EV,VD:FORT=1TO100:NEXT:NEXT:POKE368
     74,0
7050 FORT=1TO2000:NEXT
7060 IFSR=0THEN6000
7070 RETURN
8000 POKE36879,218:PRINT"{CLR}{2 DOWN}"S
     PC(24)"{RED}CHOOSE YOUR SKILL:"
8005 PRINT"{2 SPACES}{17 T
8010 PRINTSPC(45)"{BLU}LEVEL 1=60 SECOND
     S"
8020 PRINTSPC(23)"{RED}LEVEL 2=45 SECOND
     S"
8030 PRINTSPC(23)"{GRN}LEVEL 3=30 SECOND
     S"
8040 PRINTSPC(23)"{PUR}LEVEL 4=15 SECOND
     S"
8045 PRINT"{2 DOWN}{7 RIGHT}{YEL}L{BLU}E
     {GRN}V{PUR}E{CYN}L {RED}?"
8050 GETS$:IFS$=""THEN8050
8060 S=VAL(S$)
8070 IFS=1THENL$="000100":RETURN
8080 IFS=2THENL$="000045":RETURN
8090 IFS=3THENL$="000030":RETURN
8100 IFS=4THENL$="000015":RETURN
8110 GOTO8050
9000 POKE36879,138:PRINT"{CLR}"
9010 FORF=1TO150:D=INT(RND(1)*489)+7697
9020 POKED,88:POKED+30720,0:NEXTF
9030 POKE8185,160:POKE8184,160:POKE8163,
     160:POKE8162,160
9040 POKE38905,4:POKE38904,4:POKE38883,4
     :POKE38882,4
```

```
9050 POKE8141,32:POKE8183,32
9060 RETURN
9500 POKEV,15:POKES1,200:FORT=1TO500:NEX
     TT
9510 POKES1,175:FORT=1TO500:NEXTT
9520 POKES1,150:FORT=1TO600:NEXTT
9530 POKES1,0:POKEV,0
9540 SR=SR-1
9550 PRINT"{HOME}"SPC(208)"{RVS}{WHT}
     {RIGHT} {RIGHT}"SPC(19)"RIP"SPC(19)
     "{RIGHT} {RIGHT}"SPC(19)"{RIGHT}
     {RIGHT}{OFF}"
9560 FORT=1TO1000:NEXTT
9570 POKE36879,27:PRINT"{CLR}"
9580 PRINTSPC(45)"{YEL}TOO BAD!!"
9590 PRINT"{2 DOWN}{6 RIGHT}{RVS}{BLU}SC
     ORE{OFF}:{RVS}{PUR}"SO"{OFF}"
9600 PRINTSPC(67)"{GRN}"SR"{BLU}SNAKES R
     EMAINING"
9610 FORT=1TO2000:NEXTT:IFSR=0THEN6000
9620 GOTO120
10000 POKEV,15:POKES3,217:POKES3,217:POK
      EV,0:POKES3,0:RETURN
28000 BC=81:HC=87:B=7680:S3=36876:CO=384
      00:LK=0:RETURN
29000 DEFFNA(L)=INT(RND(1)*L)+7702
29010 DEFFNSC(L)=INT(RND(1)*L)+5:RETURN
30000 POKE36879,27
30010 PRINT"{CLR}{8 DOWN}{2 RIGHT}{RVS}
      {RED}{17 SPACES}"
30020 PRINT"{2 RIGHT}{RVS}{RED} {GRN}
      {15 SPACES}{RED} "
30030 PRINT"{2 RIGHT}{RVS}{RED} {GRN} SN
      AKE ESCAPE! {RED} "
30040 PRINT"{2 RIGHT}{RVS}{RED} {GRN}
      {15 SPACES}{RED} "
30050 PRINT"{2 RIGHT}{RVS}{RED}
      {17 SPACES}"
30060 PRINT"{2 DOWN}{2 RIGHT}{GRN}BY
      {CYN}DARYL BIBERDORF
30070 PRINT"{2 DOWN}{4 RIGHT}{YEL}INSTRU
      CTIONS ?"
30080 GETI$:IFI$=""THEN30080
30090 IFI$="Y"THENGOSUB4000:GOTO30120
30100 IFI$="N"THEN30120
30110 GOTO30080
30120 RETURN
```

UNDERLINE = SHIFT,
{ } = COMMODORE KEY,
[ ]= SPECIAL.
REFER TO LISTING CONVENTIONS

Program 2: 64 Version

```
5 GOTO100
10 POKE54296, 15 :POKE54277, 17 :POKE542
   78, 17
15 POKE 54276, 17 :POKE 54273, 28 :POKE5
   4272, 49
20 POKE54276,0:POKE54273,0:POKE54272,0
30 RETURN
100 SO=0:SR=3
110 GOSUB30000:GOSUB29000
120 PRINT"{CLR}"
130 GOSUB28000:GOSUB8000:GOSUB9000:GOSUB
    28000
140 TI$="000000"
150 CL=INT(RND(1)*7)+1:IFCL=5ORCL=3THEN1
    50
160 IFTI$=L$THENGOSUB7000:GOTO130
170 IFDH=0THENPOKEB,HC
180 POKEB,HC:POKECO,CL
190 K=PEEK(197)
200 IFK=34THENDR=-1:GOTO250:REM LEFT
210 IFK=37THENDR=1:GOTO250:REM RIGHT
220 IFK=33THENDR=-40:GOTO250:REM UP
230 IFK=36THENDR=40:GOTO250:REM DOWN
240 GOTO160
250 POKEB,BC:B=B+DR:CO=CO+DR:SO=SO+1
260 IFPEEK(B)=88THENDH=0:GOTO9500
270 IFPEEK(B)=160THENGOSUB5000:GOTO120
280 IFPEEK(B)=81THENGOTO9500
300 IFB<1024ORB>2023THENB=B-DR:CO=CO-DR
310 GOSUB10:GOTO150
4000 REM PRINT INSTRUCTIONS
4010 PRINT"{CLR}{DOWN}{BLU}{5 RIGHT}YOUR
      GOAL IS TO MOVE THE SNAKE OUT OF T
     HE{2 SPACES}POISON PATCH."
4020 PRINT"{DOWN}{GRN}{5 RIGHT}TRY TO AV
     OID ALL POISON ({BLK}X{CYN})."
4030 PRINT"{3 DOWN}{RED}CONTROLS:":PRINT
     "{PUR} J={RVS}LEFT":PRINT"{GRN} K=
     {RVS}RIGHT"
4040 PRINT"{CYN} I={RVS}UP":PRINT"{RED}
     M={RVS}DOWN"
4050 PRINT"{DOWN}{RED}POINT VALUES:"
4060 PRINT"{BLU}BODY SEGMENT={RVS}1{OFF}
      POINT"
4070 PRINT"{2 DOWN}{RED}YOU WILL RECEIVE
      A BONUS FOR ESCAPING."
4080 PRINT"{3 DOWN}{PUR}{RVS}{8 RIGHT}HI
     T A KEY TO START "
4090 GETA$:IFA$=""THEN4090
4100 RETURN
5000 VB=0:POKE53280,3:POKE53281,1
5010 IFS=1THENVB=20
5020 IFS=2THENVB=30
5030 IFS=3THENVB=40
5035 IFS=4THENVB=50
5040 BN=FNSC(VB)
5050 PRINT"{CLR}{6 DOWN}{8 RIGHT}{BLU}..
     .YOU HAVE ESCAPED!!!"
5060 SO=SO+BN
5070 PRINT"{2 DOWN}{15 RIGHT}{RED}{RVS}B
     ONUS{OFF}:{RVS}{BLU}"BN"{OFF}"
5080 PRINT"{2 DOWN}{15 RIGHT}{RVS}{PUR}S
     CORE{OFF}:{RVS}{GRN}"SO
5090 PRINT"{2 DOWN}{8 RIGHT}{BLU}"SR"
     {RED}SNAKES REMAINING"
5100 POKE54296, 15 :POKE54277, 83 :POKE5
     4278, 50
5102 FORHI=33TO 57STEP2:LO=INT(RND(0)*50
     )+180
5103 POKE 54276,17:FORJ=1TO60:NEXTJ:POKE
      54273,HI:POKE54272,LO:NEXT
5106 FORT=1TO 200 :NEXT:POKE54276,0:POKE
     54273,0:POKE54272,0
5120 DH=2:RETURN
6000 PRINT"{CLR}{10 DOWN}{12 RIGHT}{BLU}
     VVVVVVV
     VVVVVV"
6003 PRINT"{12 RIGHT}{BLU}V{RVS}
     {CYN}{11 RIGHT}{OFF}{BLU}V"
6005 PRINT"{12 RIGHT}VVV
     VVVVVVV
     VVV"
6010 PRINT"{HOME}{11 DOWN}{13 RIGHT}
     {RVS}{BLK} GAME"
6020 POKE54296, 15 :POKE54277, 53 :POKE5
     4278, 69
6021 POKE 54276, 33 :POKE 54273, 3 :POKE
```

```
     54272, 244
6022 FORT=1TO 900 :NEXT:POKE54276,0:POKE
     54273,0:POKE54272,0
6025 POKE36874,150:PRINT"{HOME}{11 DOWN}
     {18 RIGHT}{RVS}{BLK} OVER "
6026 POKE54296, 15 :POKE54277, 53 :POKE5
     4278, 69
6027 POKE 54276, 33 :POKE 54273, 2 :POKE
     54272, 163
6028 FORT=1TO 900 :NEXT:POKE54276,0:POKE
     54273,0:POKE54272,0
6040 PRINT"{3 DOWN}{12 RIGHT}{RED}PLAY A
     GAIN ?"
6050 GETP$:IFP$=""THEN6050
6060 IFP$="Y"THENSO=0:SR=3:LK=0:GOTO120
6070 IFP$<>"N"THEN6050
6080 PRINT"{3 DOWN}{17 RIGHT}BYE!{HOME}"
     :END
7000 SR=SR-1:POKE53280,3:POKE53281,1
7010 PRINT"{CLR}{6 DOWN} {RED}WHEW! YOU
     HAVE JUST DIED OF EXAUSTION!"
7020 PRINTSPC(14)"{4 DOWN}{GRN}Z
     {PUR}SCORE{OFF}:{RVS}{GRN}"SO
7030 PRINTSPC(9)"{5 DOWN}{RED}"SR"{BLU}S
     NAKES REMAINING"
7040 POKE54296, 10 :POKE54277, 31 :POKE5
     4278, 17
7042 POKE 54276, 33 :POKE 54273, 5 :POKE
     54272, 71
7043 FORV0=15TO5STEP-.5:POKE54296,V0:FOR
     T=1TO100:NEXT:NEXT
7045 POKE54276,0:POKE54273,0:POKE54272,0
     :POKE54296,0
7050 FORT=1TO2000:NEXT
7060 IFSR=0THEN6000
7070 RETURN
8000 POKE53280,4:POKE53281,1:PRINT"{CLR}
     {3 DOWN}"SPC(42)"{RED}CHOOSE YOUR S
     KILL:"
8005 PRINT"{2 SPACES}[17 T]"
8010 PRINTSPC(51)"{DOWN}{BLU}LEVEL 1=60
     SECONDS"
8020 PRINTSPC(51)"{RED}LEVEL 2=45 SECOND
     S"
8030 PRINTSPC(51)"{GRN}LEVEL 3=30 SECOND
     S"
8040 PRINTSPC(51)"{PUR}LEVEL 4=15 SECOND
     S"
8045 PRINT"{3 DOWN}{7 RIGHT}{YEL}L{BLU}E
     {GRN}V{PUR}E{CYN}L {RED}?"
8050 GETS$:IFS$=""THEN8050
8060 S=VAL(S$)
8070 IFS=1THENL$="000100":RETURN
8080 IFS=2THENL$="000045":RETURN
8090 IFS=3THENL$="000030":RETURN
8100 IFS=4THENL$="000015":RETURN
8110 GOTO8050
9000 POKE53280,4:POKE53281,8:PRINT"{CLR}
     "
9010 FORF=1TO150:D=INT(RND(1)*966)+1058
9020 POKED,88:POKED+54272,1:FORJ=1 TO20:
     NEXTJ:POKED+54272,0:NEXTF
9030 POKE2023,160:POKE2022,160:POKE1983,
     160:POKE1982,160
9040 POKE56295,6:POKE56294,6:POKE56255,6
     :POKE56254,6
9050 POKE1943,32:POKE2021,32
9060 RETURN
9500 POKE54296, 15 :POKE54277, 53 :POKE5
     4278, 69
9505 POKE 54276, 33 :POKE 54273, 5 :POKE
     54272, 71
9510 FORT=1TO 900 :NEXT:POKE54276,0:POKE
     54273,0:POKE54272,0
9515 POKE54296, 15 :POKE54277, 53 :POKE5
     4278, 69
9520 POKE 54276, 33 :POKE 54273, 3 :POKE
     54272, 244
9525 FORT=1TO 900 :NEXT:POKE54276,0:POKE
     54273,0:POKE54272,0
9530 POKE54296, 15 :POKE54277, 53 :POKE5
     4278, 69
9533 POKE 54276, 33 :POKE 54273, 2 :POKE
     54272, 163
9536 FORT=1TO 900 :NEXT:POKE54276,0:POKE
     54273,0:POKE54272,0
9540 SR=SR-1
9550 PRINT"{HOME}{10 DOWN}"SPC(18)"{RVS}
     {WHT}{RIGHT} {RIGHT}"SPC(37)"RIP"SP
     C(37)"{RIGHT} {RIGHT}"SPC(37)"
     {RIGHT} {RIGHT}{OFF}"
9560 FORT=1TO1000:NEXTT
9570 POKE53280,3:POKE53281,1:PRINT"{CLR}
     {5 DOWN}"
9580 PRINTSPC(14)"{RED}TOO BAD!!"
9590 PRINT"{4 DOWN}{14 RIGHT}{RVS}{BLU}S
     CORE{OFF}:{RVS}{PUR}"SO"{OFF}"
9600 PRINTSPC(8)"{4 DOWN}{GRN}"SR"{BLU}S
     NAKES REMAINING"
9610 FORT=1TO2000:NEXTT:IFSR=0THEN6000
9620 GOTO120
10000 POKEV,15:POKES3,217:POKES3,217:POK
      EV,0:POKES3,0:RETURN
28000 BC=81:HC=87:B=1024:S3=36876:CO=552
      96:LK=0:RETURN
29000 DEFFNA(L)=INT(RND(1)*L)+1064
29010 DEFFNSC(L)=INT(RND(1)*L)+5:RETURN
30000 POKE53280,3:POKE53281,1
30010 PRINT"{CLR}{8 DOWN}{11 RIGHT}{RVS}
      {RED}{17 SPACES}"
30020 PRINT"{11 RIGHT}{RVS}{RED} {GRN}
      {15 SPACES}{RED} "
30030 PRINT"{11 RIGHT}{RVS}{RED} {GRN} S
      NAKE ESCAPE! {RED} "
30040 PRINT"{11 RIGHT}{RVS}{RED} {GRN}
      {15 SPACES}{RED} "
30050 PRINT"{11 RIGHT}{RVS}{RED}
      {17 SPACES}"
30070 PRINT"{2 DOWN}{12 RIGHT}{BLU}INSTR
      UCTIONS ?"
30080 GETI$:IFI$=""THEN30080
30090 IFI$="Y"THENGOSUB4000:GOTO30120
30100 IFI$="N"THEN30120
30110 GOTO30080
30120 RETURN
```

UNDERLINE = SHIFT,
[ ] = COMMODORE KEY,
{ }= SPECIAL.
REFER TO LISTING CONVENTIONS

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ATTENTION PROGRAMMERS

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs" and "A Beginner's Guide To Typing In Programs" that appear before the Program Listings.

Program 1: VIC-20 Version

```
1 POKE51,0:POKE52,28:POKE55,0:POKE56,28:
    CLR
5 FORN=7168TO7679:POKEN,PEEK(N+25600):NE
    XTN
10 PRINT"{WHT}{CLEAR}":POKE36879,13:POKE3
    6878,15
20 DIMY(5),K(5),O(5),CO(5):AB=64
25 CO(0)=1:CO(1)=3:CO(2)=4:CO(3)=5:CO(4)=
    7
30 Z=05:A=45:CR=42:IN=-1
34 SS=7168+(41*8):FORI=0TO15:READQ:POKESS
    +I,Q:NEXTI
36 DATA 36,72,123,254,254,123,72,36,144,7
    2,123,254,254,123,72,144
40 FORN=0TO4:READY(N):NEXTN
50 DATA 7835,7879,7923,7967,8011
55 FORW=0TO4:K(W)=Y(W):NEXTW
57 PRINT"{WHT}{CLEAR}":FORP=0TO4:O(P)=48:
    NEXTP:X=7812:F=48
60 FORL=0TO5:FORI=0TO21:POKEX+I,A:NEXTI
70 POKEX+I-1,115:X=X+44:NEXTL
75 FORG=0TO4:POKEY(G)-1,49+G:POKEY(G),CR:
    POKEY(G)+30720,CO(G):NEXTG
76 REM   AB=INT(RND(1)*26)+64
77 AB=AB+1:IFAB>90THENAB=65
78 PRINT"{HOME}{DOWN}PRESS ";CHR$(18)CHR$
    (AB)CHR$(146);" TO START"
79 GETA$:IFA$=""THEN79
80 IFASC(A$)<>ABTHENGOSUB175:GOTO78
81 POKE36869,255:M=19:FORC=0TO4:IFK(C)=Y(
    C)+19THEN105
85 POKEK(C),32
90 E=INT(RND(1)+.5):K(C)=K(C)+E:IFK(C)=>Y
    (C)+MTHENK(C)=Y(C)+M:F=F+1
100 POKEK(C),CR:POKEK(C)+30720,CO(C):FOR J
    =0TOZ:NEXTJ:IFK(C)=Y(C)+MTHEN105
102 GOTO110
105 IFO(C)<>1THENPOKEK(C)+1,F:POKEK(C),42:
    O(C)=1:GOSUB200
110 NEXTC
115 CR=CR+IN:IN=IN*-1:IFF<53THEN81
118 POKE36869,240
120 PRINT"{HOME}{19 DOWN}AGAIN? 'Y' OR 'N'
    "
130 GETY$:IFY$=""THEN130
140 IFY$="Y"THENCR=42:IN=-1:GOTO55
145 IFY$<>"N"THENGOSUB175:GOTO120
150 END
175 FORD=0TO30:POKE36877,128:NEXTD:POKE368
    77,0:RETURN
200 FORD=0TO25:POKE36875,241:NEXTD:POKE368
    75,0:RETURN
```

Program 2: 64 Version

```
0 PRINT"{CLEAR}INITIALIZING"
1 POKE52,48:POKE56,48:CLR:POKE56334,PEEK
    (56334)AND254:POKE1,PEEK(1)AND251

5 FORN=0TO1279:POKEN+12288,PEEK(N+53248)
    :NEXTN:POKE1,PEEK(1)OR4
6 POKE56334,PEEK(56334)OR1
10 PRINT"{BLK}{CLEAR}":POKE53281,1
20 DIMY(5),K(5),O(5),CO(5):AB=64
25 CO(0)=0:CO(1)=3:CO(2)=4:CO(3)=5:CO(4)=
    7
30 Z=05:A=45:CR=42:IN=-1:WX=54272
34 SS=12288+(41*8):FORI=0TO15:READQ:POKES
    S+I,Q:NEXTI
36 DATA 36,72,123,254,254,123,72,36,144,7
    2,123,254,254,123,72,144
40 FORN=0TO4:READY(N):NEXTN
50 DATA 1306,1386,1466,1546,1626
55 FORW=0TO4:K(W)=Y(W):NEXTW
57 PRINT"{WHT}{CLEAR}":FORP=0TO4:O(P)=48:
    NEXTP:X=1264:F=48
60 FORL=0TO5:FORI=0TO39:POKEX+I,A:POKEX+I
    +WX,0:  NEXTI
70 POKEX+I-1,115:X=X+80:NEXTL
74 FORG=0TO4:POKEY(G)-1+WX,0:POKEY(G)+WX,
    CR:NEXTG
75 FORG=0TO4:POKEY(G)-1,49+G:POKEY(G),CR:
    NEXTG
76 REM   AB=INT(RND(1)*26)+64
77 AB=AB+1:IFAB>90THENAB=65
78 PRINT"{HOME}{BLK}{DOWN}PRESS ";CHR$(18
    )CHR$(AB)CHR$(146);" TO START"
79 GETA$:IFA$=""THEN79
80 IFASC(A$)<>ABTHENGOSUB174:GOTO78
81 POKE53272,(PEEK(53272)AND240)+12: M=35
    :FORC=0TO4:IFK(C)=Y(C)+35THEN105
85 POKEK(C),32
90 E=INT(RND(0)+.5)+1.5:K(C)=K(C)+E:IFK(C
    )=>Y(C)+M-1.5THENK(C)=Y(C)+M:F=F+
    1
100 POKEK(C),CR:POKEK(C)+WX,CO(C):FOR J=0T
    OZ:NEXTJ:IFK(C)=Y(C)+MTHEN105
102 GOTO110
105 IFO(C)<>1THENPOKEK(C)+1,F:POKEK(C)+1+W
    X,0:POKEK(C),42:O(C)=1:GOSUB200
110 NEXTC
115 CR=CR+IN:IN=IN*-1:IFF<53THEN81
118 POKE53272,21
120 PRINT"{HOME}{BLK}{19 DOWN}AGAIN? 'Y' O
    R 'N'"
130 GETY$:IFY$=""THEN130
140 IFY$="Y"THENCR=42:IN=-1:GOTO55
145 IFY$<>"N"THENGOSUB174:GOTO120
150 END
174 SO=54272:FORGH=SOTOSO+24:POKEGH,0:NEXT
    :POKESO+24,15:POKESO+1,34:POKESO,
    75
175 POKESO+5,72:POKESO+6,72
176 POKESO+4,129:FORT=1TO500:NEXT
177 FORGH=10TO0STEP-1:POKESO+24,GH:NEXT
178 RETURN
200 SO=54272:FORGH=SOTOSO+24:POKEGH,0:NEXT
    :POKESO+24,15:POKESO+1,34:POKESO,
    75
205 POKESO+5,72:POKESO+6,72
210 POKESO+4,17:FORT=1TO500:NEXT
215 FORGH=10TO0STEP-1:POKESO+24,GH:NEXT
220 RETURN
```

VIC Marquee

ATTENTION PROGRAMMERS

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs" and "A Beginner's Guide To Typing In Programs" that appear before the Program Listings.

Moving Message

```
1 REM VIC MARQUEE
2 PRINT"{CLEAR}"
```

```
10 REM COLOR FOR MARQUEE
11 FORI=0TO21:POKE38400+I,6:NEXTI
20 GOSUB800:REM MARQUEE LOADER
30 GOSUB2000:REM MESSAGE
40 SYS1008:REM STARTS MARQUEE
50 END
800 REM MARQUEE BASIC LOADER
801 FORAD=864TO1015:READ D:POKEAD,D:NEXTAD
864 DATA22,0,15,191,234,7
870 DATA15,22,160,1,185,0
876 DATA30,153,255,29,200,204
882 DATA96,3,208,244,32,161
888 DATA3,205,97,3,240,15
894 DATA192,255,240,11,200,140
900 DATA101,3,172,96,3,153
906 DATA255,29,96,172,96,3
912 DATA169,32,153,255,29,238
918 DATA103,3,173,103,3,205
924 DATA96,3,176,48,96,172
930 DATA101,3,177,0,41,191
936 DATA96,141,0,0,142,1
942 DATA0,169,0,141,103,3
948 DATA141,101,3,173,20,3
954 DATA141,99,3,173,21,3
960 DATA141,100,3,120,169,223
966 DATA141,20,3,169,3,141
972 DATA21,3,88,96,120,173
978 DATA99,3,141,20,3,173
984 DATA100,3,141,21,3,88
990 DATA96,206,102,3,16,9
996 DATA32,104,3,173,98,3
1002 DATA141,102,3,108,99,3
1008 DATA162,3,169,62,32,169
1014 DATA3,96
1016 RETURN
2000 REM MARQUEE MESSAGE
2001 FORAD=830TO859:READ D:POKEAD,D:NEXTAD
2030 DATA86,73,67,32,77,65,82,81,85,69
2040 DATA69,32,66,89,32,76,79,85,32,77
2050 DATA69,78,68,69,76,83,79,72,78,0
2060 RETURN
```

Word Hunt

ATTENTION PROGRAMMERS

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs" and "A Beginner's Guide To Typing In Programs" that appear before the Program Listings.

Program 1: Word Hunt — VIC Version

Note: See "How To Type In COMPUTE!'s Gazette Programs" to understand the underlined characters.

```
2 CLR
3 A=0
4 POKE36879,8
5 A=A+1
10 PRINT"{CLR}":PRINT"{7 DOWN}{4 RIGHT}
   {DOWN}{RVS}QQQQQQQQQQQQQ"
11 PRINT"{RVS}{4 RIGHT}Q{11 SPACES}
   Q"
12 PRINT"{RVS}{4 RIGHT}Q WORD HUNT
   Q"
13 PRINT"{RVS}{4 RIGHT}Q{11 SPACES}
   Q"
14 PRINT"{RVS}{4 RIGHT}QQQQQQQQQQQQ{OFF}"

20 FOR X=1TO200:NEXT:PRINT"{CLR}"
25 L$="{WHT}{YEL}{GRN}{PUR}{RED}{CYN}":P
   RINT MID$(L$,A,1):IF A<7 THEN 5
70 FOR X=1 TO VAL(RIGHT$(TI$,2)):R=RND(1
   ):NEXT
80 S=10:W=10:DIM M(S,S),W$(W),P(S,S),L(W
   ,3),F(8)
90 POKE36879,253:PRINT"{CLR}{DOWN}{BLU}W
   HAT SKILL LEVEL"
95 PRINT:PRINT:PRINT
100 PRINT"{PUR}1(EASY) TO 5(HARD)
    {3 SPACES}3{3 LEFT}";
110 INPUTR$:X=VAL(R$):IF X<1 AND X>5 THE
    N 90
120 SL=9-X
130 PRINT"{BLK}{2 DOWN}ENTER"W"WORDS,"
140 PRINT:PRINT"MAKE EACH WORD 3 TO 8"
150 PRINT:PRINT"CHARACTERS LONG."
170 FOR X=1TOW:L(X,1)=0:L(X,2)=0:L(X,3)=
    0
180 PRINT:PRINT"{RED}WORD";X;TAB(8);"
    {2 RIGHT}?{3 LEFT}";
190 INPUT R$:Q=LEN(R$)
200 IF Q<3 THEN PRINTTAB(26);"{RVS}{BLU}
    {UP}* TOO SHORT *{OFF}":GOTO 180
210 IF Q>8 THEN PRINTTAB(26);"{RVS}{PUR}
    {UP}* TOO LONG *{OFF}":GOTO 180
220 X9=0:FOR Y=1TOQ:A=ASC(MID$("*"+R$+"*
    ",Y+1,1))
230 IF A<65 OR A>90 THEN X9=1:Y=Q
240 NEXT Y:IF X9=1 THEN PRINTTAB(26)"
    {UP}* BAD WORD *":GOTO 180
250 IF X=11 THEN W$(X)R$+"*":GOTO290
260 X9=0:FORY=1TOX:IFQ<=LEN(W$(Y))-1 THE
    N 280
270 FOR B=XTOY+1STEP-1:W$(B)=W$(B-1):NEX
    T:W$(Y)=R$+"*":X9=1:Y=X-1
280 NEXT
290 NEXT
295 POKE36879,194
300 PRINT"{BLU}{CLR}{4 DOWN}{23 SPACES}T
    HAT'S ENOUGH WORDS!{23 SPACES}"
310 PRINT"{PUR}{4 DOWN}{23 SPACES}PLEASE
     BE PATIENT...{23 SPACES}"
320 PRINT"{BLK}{2 DOWN}{22 SPACES}I'M MA
    KING THE PUZZLE!{22 SPACES}"
340 FOR X=1TOS:FORY=1TOS:M(Y,X)=42:NEXT:
    NEXT:Q=0
360 FOR X=1 TO S:FORY=1TOS:P(Y,X)=0:NEXT
370 NEXT:Q=Q+1:IF Q>W THEN 760
380 G=LEN(W$(Q))-2
400 X9=0:FORX=1TOS:FORY=1TOS:IF P(Y,X)=0
    THENX9=1:X=S:Y=S
410 NEXT:NEXT:IF X9=1 THEN 450
430 PRINT"{CLR}THIS LIST OF WORDS
    {4 SPACES}WILL NOT ALL FIT
440 PRINT"PLEASE ENTER NEW WORDS":GOTO13
    0
450 A=INT(S*RND(1)+1):B=INT(S*RND(1)+1):
    IF P(B,A)<>0 THEN 450
460 P(B,A)=1:IF M(B,A)=42 THEN 490
470 IF M(B,A)<>ASC(LEFT$(W$(Q),1))THEN40
    0
490 FOR X=1TO8:F(X)=0:NEXT
500 X9=0:FOR X=1TO8:IF F(X)=0 THEN X9=1:
    X=8
```

```
510 NEXT:IF X9=0THEN400
520 D=INT(8*RND(1)+1):IF F(D)=1 THEN 520
530 F(D)=1:ON D GOTO 550,590,580,620,610
    ,650,640,560
550 IF (A+G)>S THEN 500
560 IF (B-G)<1 THEN 500
570 GOTO 670
580 IF (B+G)>S THEN 500
590 IF (A+G)>S THEN 500
600 GOTO 670
610 IF (A-G)<1 THEN 500
620 IF (B+G)>S THEN 500
630 GOTO 670
640 IF (B-G)<1 THEN 500
650 IF (A-G)<1 THEN 500
670 X=A:Y=B:X9=0:FORN=2TOG+1:GOSUB1550:I
    F M(Y,X)=42 THEN 690
680 IF M(Y,X)<>ASC(MID$(W$(Q),N,1)) THEN
     X9=1:N=G+1
690 NEXT:X=A:Y=B:IF X9=1 THEN500
710 FOR N=1TOG+1:IF M(Y,X)=42 THEN M(Y,X
    )=ASC(MID$(W$(Q),N,1))
720 GOSUB 1550:NEXT
740 L(Q,1)=A-1:L(Q,2)=B-1:L(Q,3)=D:IF Q<
    W THEN360
760 FOR Y=1TOS:FORX=1TOS:IFM(Y,X)=42 THE
    NM(Y,X)=INT(25*RND(1)+65)
770 NEXT:NEXT:WP=0:TS=0
775 POKE36879,15
780 PRINT"{CYN}{CLR}{5 DOWN}{RVS}READY"
790 PRINT"{GRN}{5 DOWN}PRESS ANY KEY TO
    PLAY"
800 R$="":GETR$:IF R$="" THEN 800
810 POKE36879,25
820 PRINT"{BLU}{CLR}{DOWN} {DOWN}
    {2 SPACES}{RVS}COLUMN";TAB(14);"
    {CYN}{RVS}{UP}W O R D"
860 PRINT"{BLU}{4 DOWN}{RVS}R{DOWN}
    {LEFT}O{DOWN}{LEFT}W{5 UP}{2 LEFT}
    {OFF}";
861 PRINT"{BLK}{4 RIGHT}";
870 FORX=0TOS-1:PRINTRIGHT$(STR$(X),1);:
    NEXTX:PRINT:Y=1:GOSUB1650
880 FORY=1TOS:PRINT"{RIGHT}";RIGHT$(STR$
    (Y-1),1);"-";
890 FORX=1TOS:PRINTCHR$(M(Y,X));:NEXTX
900 PRINT"-":NEXTY:Y=0:GOSUB1650
910 PRINT"{RED}{RVS}{DOWN}{3 SPACES}7 8
    1{3 SPACES}"
920 PRINT"{RVS}{4 SPACES}M-N
    {4 SPACES}":PRINT"{RVS}{3 SPACES}6
    *Q*2{3 SPACES}"
921 PRINT"{RVS}{4 SPACES}NBM
    {4 SPACES}":PRINT"{RVS}{3 SPACES}5 4
     3{3 SPACES}"
930 G=17:GOSUB1700:PRINT:PRINT"{UP}"TAB(
    12);:PRINT"{PUR}{RVS}{2 SPACES}SCORE
    {2 SPACES}":PRINTTAB(12);"£J£
    {7 SPACES}£L£"
940 PRINTTAB(12);"£J£{3 SPACES}0
    {3 SPACES}£L£"
950 PRINTTAB(12);"£J£{7 SPACES}
    £L£"
951 PRINTTAB(12);"£9 U£":PRINT"
    {HOME}"
960 G=2:GOSUB1700:PRINT"{9 SPACES}"
970 WP=WP+1:IFWP>WTHEN1450
980 Q=LEN(W$(WP))-1
1000 GOSUB1700:PRINTTAB(15-(Q/2));LEFT$(
     W$(WP),Q):TI$="000000"
1020 G=4:GOSUB1700:PRINTTAB(15);"{BLU}LO
     C."
1025 PRINTTAB(15)"{GRN}ROW{BLK},{RED}COL
     "
1030 FORG=6TO11:GOSUB1700:
1040 PRINT"{5 SPACES}":NEXTG:G=6:GOSUB17
     00
1050 B$="":GETB$:IFB$=""THEN1050
1060 IF ASC(B$)=13THEN1050
1070 PRINTB$;",";:IFB$="0"THENB=0:GOTO10
     90
1080 B=VAL(B$):IFB<1ORB>9THENPRINT"
     {2 LEFT}{2 SPACES}{2 LEFT}";:GOTO10
     50
1090 A$="":GETA$:IFA$=""THEN1090
1100 IF ASC(A$)=13THEN1090
1110 PRINTA$:IFA$="0"THENA=0:GOTO1140
1120 A=VAL(A$):IFA<1ORA>9THEN1030
1140 G=7:GOSUB1700:PRINT"DIR:":PRINT:PRI
     NTTAB(15);" {LEFT}";
1150 GETD$:IFD$=""THEN1150
1160 IF ASC(D$)=13THEN1150
1170 PRINT"{UP}{RIGHT}";D$:D=VAL(D$):IFD
     <1ORD>8THEN1140
1190 WT=TI:IFB<>L(WP,2)THEN1230
1200 IF A<>L(WP,1)THEN1230
1210 IF D=L(WP,3)THEN1360
1230 X=A+1:Y=B+1:G=LEN(W$(WP))-1:IFM(Y,X
     )<>ASC(LEFT$(W$(WP),1))THEN1300
1240 X9=0:FORN=2TOG:GOSUB1550:IF X<1ORX>
     10THEN1270
1250 IF Y<1 OR Y>10 THEN1270
1260 IF M(Y,X)=ASC(MID$(W$(WP),N,1))THEN
     1280
1270 X9=1:N=G
1280 NEXTN:IF X9=0THEN 1360
1300 G=6:GOSUB 1700:PRINTSPC(0);:B$=STR$
     (L(WP,2)):A$=STR$(L(WP,1))
1310 PRINTRIGHT$(B$,LEN(B$)-1);",";RIGHT
     $(A$,LEN(A$)-1)
1320 G=8:GOSUB1700:PRINT SPC(1);L(WP,3)
1330 G=10:GOSUB 1700:PRINT"↑"
1340 G=11:GOSUB1700:PRINT"J {RVS} NO
     {OFF}"
1341 G=13:GOSUB1700:PRINT"{DOWN}HIT ANY"
     :G=13:GOSUB1700:PRINT"{2 DOWN}
     {2 SPACES}KEY"
1342 QW$="":GETQW$:IFQW$=""THEN1342
1343 G=10:GOSUB1700:PRINT" "
1344 G=11:GOSUB1700:PRINT"{5 SPACES}"
1345 G=13:GOSUB1700:PRINT"{DOWN}
     {7 SPACES}":G=13:GOSUB1700:PRINT"
     {2 DOWN}{5 SPACES}"
1350 GOTO 1420
1360 IF WT<(SL*60)THENWS=100:GOTO1390
1370 IF WT<(SL*1200)THENWS=10:GOTO1390
1380 WS=5+INT((SL*1200)-WT)/60)
1390 G=10:GOSUB1700:PRINT"↑"
1400 G=11:GOSUB1700:PRINT"{RVS}Y{OFF},
     {LEFT}"WS:TS=TS+WS
1420 G=17+2:GOSUB1700:PRINT TS
1430 GOTO 960
1450 PRINT"{HOME}{15 DOWN}"
1460 FORX=1TO6:PRINT"{12 SPACES}":NEXTX
1470 FORG=-2TO14:GOSUB1700
1480 PRINT"{22 SPACES}":NEXTG
1490 FORX=1TO1500:NEXTX:PRINT"{CLR}"
1491 POKE36879,76
1492 PRINT"{HOME}{8 DOWN}{YEL}DO YOU WIS
     H TO PLAY{3 SPACES}{DOWN}ANOTHER GA
     ME? IF YOU{2 SPACES}{DOWN}DO ENTER
     Y FOR YES."
```

```
1493 PRINT"{DOWN}IF YOU DON'T ENTER N
     {2 SPACES}{DOWN}FOR NO.
1500 R$="":GETR$:IFR$=""THEN1500
1505 IFR$="N"THEN1520
1510 IF R$="Y"THEN90
1515 IFR$<>"N"ANDR$<>"Y"THEN1500
1520 PRINT"{CLR}":POKE36879,42
1525 PRINT"{HOME}{7 DOWN}{CYN}THANK YOU
     FOR PLAYING {DOWN}{YEL}WORD HUNT
     {CYN}. HOPE YOU{3 SPACES}{DOWN}HAD
     FUN.
1530 PRINT"{2 DOWN}{6 RIGHT}{GRN}SEE YOU
      LATER!!!"
1535 FORX=1TO5000:NEXTX:PRINT"{CLR}":POK
     E36879,110
1540 PRINT"{HOME}{10 DOWN}{CYN}
     {4 SPACES}END OF PROGRAM":FORI=1 TO
      1000:NEXT I
1541 PRINT"{CLR}":POKE 36879,27:END
1550 ON D GOTO 1560,1570,1580,1590,1600,
     1610,1620,1630
1560 Y=Y-1
1570 X=X+1:RETURN
1580 X=X+1
1590 Y=Y+1:RETURN
1600 Y=Y+1
1610 X=X-1:RETURN
1620 X=X-1
1630 Y=Y-1:RETURN
1650 PRINT"{2 RIGHT}";:IFY=1THENPRINT"
     [A]";:GOTO1670
1660 PRINT"[Z]";
1670 FORX=0TOS-1:PRINT"*";:NEXTX:IFY=
     1THENPRINT"[S]":RETURN
1680 PRINT"[X]":RETURN
1700 PRINT"{HOME}"TAB(14);:FORX9=1TOG:PR
     INT"{BLK}{DOWN}";:NEXTX9:RETURN
```

```
UNDERLINE = SHIFT,
[ ] = COMMODORE KEY,
{ }= SPECIAL.
REFER TO LISTING CONVENTIONS
```

Program 2: Word Hunt – 64 Version

Substitute the following lines into Program 1 for the 64 version.

```
4 POKE53280,0:POKE 53281,0
10 PRINT"{CLR}":PRINT"{7 DOWN}{10 RIGHT}
   {DOWN}{RVS}QQQQQQQQQQQQQQQQQQQ"
11 PRINT"{RVS}{10 RIGHT}Q{18 SPACES}
   Q"
12 PRINT"{RVS}{10 RIGHT}Q{5 SPACES}W
   ORD HUNT{4 SPACES}Q"
13 PRINT"{RVS}{10 RIGHT}Q{18 SPACES}
   Q"
14 PRINT"{RVS}{10 RIGHT}QQQQQQQQQQQ
   QQQQQQQQ Q{OFF}"
90 POKE53280,4:POKE53281,1:PRINT"{CLR}
   {DOWN}{BLU}WHAT SKILL LEVEL"
295 POKE53281,1
300 PRINT"{RVS}{BLU}{CLR}{6 DOWN}
    {10 SPACES}THAT'S ENOUGH WORDS!
    {10 SPACES}"
310 PRINT"{RVS}{PUR}{5 DOWN}{10 SPACES}P
    LEASE BE PATIENT...{10 SPACES}"
320 PRINT"{RVS}{BLK}{4 DOWN}{9 SPACES}I'
    M MAKING THE PUZZLE!{9 SPACES}"
430 PRINT"{CLR}THIS LIST OF WORDS WILL N
    OT ALL FIT
775 POKE53280,7
780 PRINT"{BLU}{CLR}{5 DOWN}{RVS}READY"
790 PRINT"{GRN}{5 DOWN}{9 RIGHT}PRESS AN
    Y KEY TO PLAY"
810 POKE53280,1
1480 PRINT"{41 SPACES}":NEXTG
1491 POKE53280,4:POKE 53281,6
1492 PRINT"{HOME}{8 DOWN}{WHT}DO YOU WIS
     H TO PLAY ANOTHER GAME?":PRINT"
     {DOWN}IF YOU DO, ";
1493 PRINT"ENTER Y FOR YES.":PRINT"
     {DOWN}IF YOU DON'T ENTER N FOR NO."
1520 PRINT"{CLR}":POKE53280,2:POKE 53281
     ,10
1525 PRINT"{HOME}{7 DOWN}{4 RIGHT}{WHT}T
     HANK YOU FOR PLAYING {YEL}WORD HUNT
     ."
1527 PRINT"{2 DOWN}{WHT}{10 RIGHT}HOPE Y
     OU HAD FUN!!"
1530 PRINT"{2 DOWN}{11 RIGHT}{WHT}SEE YO
     U LATER!!!"
1535 FORX=1TO5000:NEXTX:PRINT"{CLR}":POK
     E53280,6:POKE 53281,6
1541 SYS 2048:END
```

```
UNDERLINE = SHIFT,
[ ] = COMMODORE KEY,
{ }= SPECIAL.
REFER TO LISTING CONVENTIONS
```

VIC Timepiece

ATTENTION PROGRAMMERS

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Rolling-Ball Clock

```
10 T=36874:POKET,0:POKE36875,0:POKE36876
   ,0
15 S=36877:VO=36878:POKEVO,0
20 POKE36879,137:POKE657,128
30 DIMA(40),B(48)
50 PRINT"{CLR}{RVS}{WHT}"TAB(5)"BALL CLO
   CK{OFF}":PRINT"{DOWN}TO SET TIME, PRE
   SS KEY"
60 PRINT"{DOWN}WHEN ENTERING TIME,
   {3 SPACES}GIVE HOURS AND MINUTESIN TH
   IS MANNER:"
70 PRINT"{YEL}{DOWN}915{RVS}RETURN{OFF}
   OR"
80 PRINT"{YEL}{DOWN}1231{RVS}RETURN{OFF}
   ":PRINTTAB(88)"(PRESS ANY KEY)
83 POKE198,0
85 GETA$:IFA$=""THEN85
90 GOSUB1000
100 REM DRAW CLOCK
105 PRINT"{HOME}{DOWN}{RED}{RVS}"TAB(12)
    "{9 SPACES}"
110 PRINT"{BLK}{3 DOWN}{RVS}{2 SPACES}
    {UP}{LEFT}{OFF}[D]{RVS}{DOWN}1
    234{RED}{8 SPACES}"
```

```
120 PRINT"{4 DOWN}{BLK}{RVS} 1122334455
    {RED}{5 SPACES}"
130 PRINT"{BLK}{RVS}50505050505{RED}
    {5 SPACES}"
140 PRINT"{BLK}{4 DOWN}{RVS}{9 SPACES}11
    1{RED}{5 SPACES}"
150 PRINT"{BLK}{RVS}123456789012{RED}
    {4 SPACES}{OFF}b"
160 PRINTTAB(17)"{RED}{RVS}b
    {DOWN}{2 LEFT}b{OFF}b
    {DOWN}{3 LEFT}{RVS}b{OFF}
    b"
170 PRINT"{DOWN}{WHT}{5 SPACES}QQQQQQQQQ
    QQQQQQQ{5 UP}";:POKE8185,81

200 REM READ DATA
210 FORU=1TO40:READA(U):NEXT
220 FORU=1TO33:READB(U):NEXT:GOTO900
300 REM START OF BALL MOVEMENT ROUTINE
310 FORX=1TO40
320 POKEA(X),81

325 IFX>22THENPOKEA(X-1),32
330 IFX>1ANDX<24THENPOKEA(X-1),99
340 IFX>2THENPOKEA(X-2),32
350 GOSUB2000:NEXT:POKE8185,81
400 REM CONT TO MINUTES

410 L=A(40)
420 IFPEEK(L-1)=81THEN500
430 L=L-1:POKEL+1,32:POKEL,81:IFPEEK(L-1
    )=81THEN900
440 IFL=A(40)-4THEN900
450 GOSUB2010:GOTO430
460 POKEVO,0
500 REM MINUTES FULL,{9 SPACES}GOTO 5'S
505 Z=7892
510 FORX=5TO22:POKEB(X),81:POKEB(X-5),32
    :GOSUB2040:NEXT
520 FORX=23TO38:POKEB(X),81
525 Z=Z-1:IFPEEK(Z)<>81ANDZ>7877THENPOKE
    Z,81:POKEZ+1,32
530 POKEB(X-4),32:GOSUB2080:NEXT:POKEVO,0
600 IFPEEK(7889)<>81THEN900:REM OR 5'S FULL
605 Z=7880
610 FORX=7889TO7892:POKEX,81:POKEX-12,32
    :GOSUB2080:NEXT
620 FORX=18TO28:POKEB(X),81
630 Z=Z+1:POKEZ,32:GOSUB2060:NEXT
640 FORX=29TO37:POKEB(X),81:POKEB(X-12),32
650 GOSUB2040:NEXT
659 Z=B(37-11)
660 FORX=37TO44:POKEB(X),81:POKEB(X-11),32
670 Z=Z-1:IFPEEK(Z)<>81THENPOKEZ,81:POKE
    Z+1,32
680 GOSUB2040:NEXT:
690 IFZ-1>8009ANDPEEK(Z-1)<>81THENZ=Z-1:
    POKEZ,81:POKEZ+1,32:GOSUB2015:GOTO690
695 POKEVO,0
700 IFPEEK(8022)<>81THEN900
710 REM HRS FILLED↑
720 FORX=8023TO8027:POKEX,81:POKEX-12,32
730 GOSUB2100:NEXT
740 FORX=1TO12:POKEB(X+26),81:POKE8015+X,32
750 GOSUB2100:NEXT
760 FORX=1TO7:POKEB(27+X),32:GOSUB2110:N
    EXT
900 REM TIME FOR ACTION!
905 POKEVO,0
910 IFRIGHT$(TI$,2)>"57"THEN300
920 GETA$:IFA$<>""THENRUN
930 GOTO900
1000 REM TIME SETTING ROUTINE
1010 PRINT"{CLR}"TAB(53)"TIME?{HOME}"TAB
     (90)"(IN 3 OR 4 DIGITS)"
1020 INPUTA$
1030 A$="0"+A$:A$=RIGHT$(A$,4)
1040 A=VAL(LEFT$(A$,2)):B=VAL(RIGHT$(A$,
     2)):C=INT(B/5):B=B-5*C
1045 IFA>12ORC>11THEN1000
1050 REM SETTING CLOCK
1055 PRINT"{CLR}"
1060 FORX=1TOA:POKE8009+X,81:NEXT:REM HRS
1070 X=0
1080 X=X+1:IFX>BTHEN1100
1090 POKE7769+X,81:GOTO1080:REM MINUTES
1100 X=0
1110 X=X+1:IFX>CTHEN1130
1120 POKE7877+X,81:GOTO1110
1130 GOTO100
2000 REM SOUND
2005 GOTO2020
2010 IFX=37THEN2190
2015 POKEVO,10:FORV=1TO4:POKES,244:FORW=
     1TO2:NEXT:POKES,240:NEXT:RETURN
2020 IFX<24THENFORY=1TO55:NEXT:RETURN
2030 IFX>33ANDX<37THENPOKEVO,0:RETURN
2035 GOTO2010
2040 IFPEEK(7892)=81THENGOTO2190
2060 IFPEEK(8026)=81THENGOTO2190
2080 IFPEEK(B(29))=81THENGOTO2190
2085 IFPEEK(B(32))=81THENGOTO2190
2090 IFPEEK(B(26))=81THENGOTO2190
2100 IFPEEK(8071)=81THEN2190
2110 IFPEEK(8155)=81THEN2190
2120 GOTO2015
2180 IFX>4THEN2015
2190 POKEVO,15:POKET,245:FORY=1TO9:NEXT:
     POKET,0:FORY=1TO60:NEXT:RETURN
7999 GOTO7999
8000 DATA8185,8163,8141,8119,8097,8075,8
     053,8031,8009,7987,7965,7943,7921,7
     899:REM STND
8010 DATA7877,7855,7833,7811,7789,7767,7
     745,7723,7701,7700,7699,7698,7697,7
     696,7695
8020 DATA7694,7693,7692,7691,7712,7734,7
     756,7778,7777,7776,7775,7774
8025 DATA7770,7771,7772,7773
8030 DATA7774,7775,7776,7777,7778,7779,7
     780,7781,7782,7804,7826,7848,7870,7
     892,7893
8040 DATA7894,7916,7938,7960,7982,8004,8
     026,8027,8049,8071,8092,8113,8134,8155
```

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[ ] = COMMODORE KEY,
{ }= SPECIAL.
REFER TO LISTING CONVENTIONS

Using Joysticks On The 64

ATTENTION PROGRAMMERS

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Program Explanation

This program contains three subroutines you can use in your own programs. Lines 10-70 just test the subroutines and show you how to use them. The subroutine at 500 will accept a yes or no answer (left = no, right = yes) and return it in A$.

Lines 700-770 let the user enter a number by counting it up and down with the joystick. The number can be found in the variable C. C will not exceed the limits of MN (minimum) and MX (maximum). The user presses the joybutton to exit. Notice the POKE 198,0. Since the first joystick interferes with the keyboard, this POKE is used to clear it out.

You can use the subroutine at 800 to accept a letter of the alphabet. The letter is returned as a number from 1-26 in the variable C. In the sample program (line 20), it is used to accept a three-digit string of initials.

Example Program

```
10 PRINT"ENTER YOUR INITIALS:";
20 GOSUB800:N$=N$+CHR$(C+64):IFLEN(N$)<3
   THEN20
30 PRINT: PRINT"HOW OLD ARE YOU? ";:GOSU
   B700:AGE=C
40 PRINT:PRINTN$;", YOU CLAIM TO BE";AGE
   ;"YEARS OLD."
50 PRINT:PRINT"IS THAT TRUE?";:GOSUB500
60 PRINTA$:IFA$="YES"THENPRINT"GOOD FOR
   YOU":END
70 PRINT"SO WHAT IS THE TRUTH?":GOTO 30
500 REM SUBROUTINE FOR YES/NO
505 A$=""
510 V=15-(PEEK(56321)AND15)
520 IF(VAND4)>0 THEN A$="NO"
530 IF(VAND8)>0 THEN A$="YES"
540 IFA$=""THEN510
550 POKE 198,0:REM GET RID OF ANY EXTRA
    KEYS
560 RETURN
600 REM COUNTING SUBROUTINE
610 REM C WILL CONTAIN THE COUNT
620 REM VARIABLE MX AND MN CONTROL
630 REM THE MAXIMUM AND MINIMUM
640 REM VALUES ALLOWED.{2 SPACES}USE
650 REM GOSUB 700 FOR THE DEFAULT
660 REM (1 AND 10), OR GOSUB 710
670 REM IF YOU ALTER MX AND MN
700 MN=1:MX=99
710 C=MN
720 PRINTRIGHT$("{2 SPACES}"+STR$(C),2);
    "{2 LEFT}";
730 V=15-(PEEK(56321)AND15)
740 C=C+((VAND8)=8)*(C<MX)-((VAND4)=4)*(
    C>MN)
750 REM IF FIRE BUTTON PRESSED, EXIT
760 IF(PEEK(56321)AND16)=0THENPOKE198,0:
    PRINT"{2 RIGHT}";:RETURN
770 GOTO 720
800 REM TEXT ENTRY:SIMILAR TO NUMBER COU
    NTING ROUTINE
810 C=1
820 PRINT CHR$(64+C);"{LEFT}";
830 V=15-(PEEK(56321)AND15)
840 C=C+((VAND8)=8)*(C<26)-((VAND4)=4)*(
    C>1)
850 IF(PEEK(56321)AND16)=0THENPOKE198,0:
    PRINT"{RIGHT}";:RETURN
860 GOTO820
```

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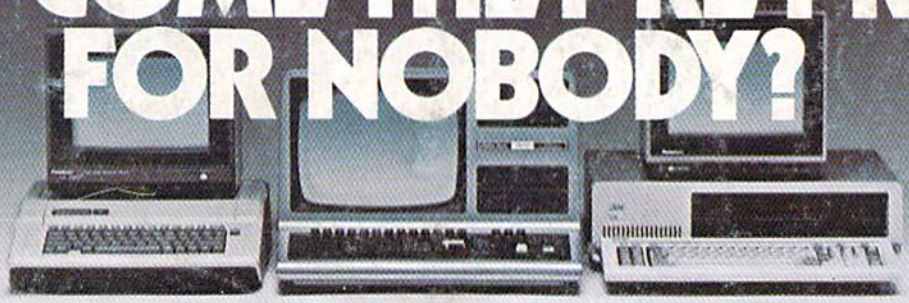

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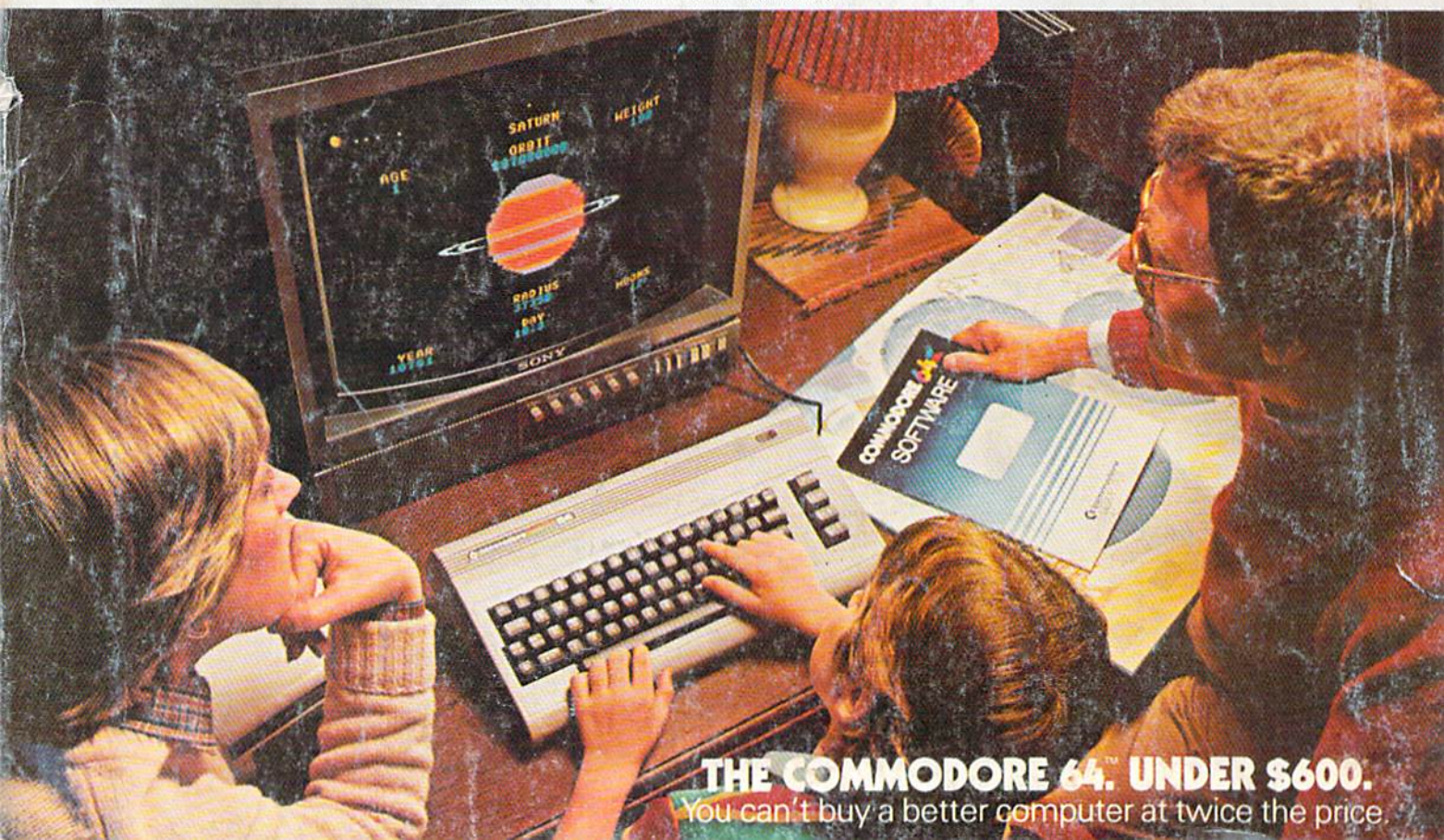

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